JUNE

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION AND THE DENTAL COSMOS

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Dental Porcelains—*Skinner and Fitzgerald*
Gingivitis and Stomatitis—*Tishler*
Immediate Dentures—*Jordan*
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EDITORIAL DEPARTMENT
Our Detractors
Opening the Bite

COUNCIL ON DENTAL THERAPEUTICS

ASSOCIATION ACTIVITIES

BUREAU OF PUBLIC RELATIONS

DENTAL ECONOMICS

FIFTY CENTS

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RESTORING LOST VERTICAL DIMENSION

By PAUL A. EDMAND, D.D.S., Chicago, Ill.

THE favorable results obtained from increasing the vertical dimension of the jaws for patients suffering from neuralgia and ear symptoms are now a matter of record. These records should be an incentive for the dentist to increase his skill, and for the otolaryngologist to increase his knowledge of the relationship of disturbances of the ear to functional disturbances of the temporomandibular joint.

Mouth conditions have become an important factor in health, and, fortunately, advances in dental science have taught us that, in restoring lost vertical dimension, tooth preparation and replacements alone are not the necessary objectives, but that attainment of balanced occlusion is paramount.

For a number of years, operators have been interested in the so-called opening of the bite. Many theories and technics have been offered as guides in this work, but the end-results have not always been satisfactory. It shall be my purpose to present a technic whereby a minimum of error will exist in the finished work.

Since some here may not have been interested in this work heretofore, I quote from Costen his description of the anatomy of this area:

The chief function of the jaw being mastication, it is equipped with powerful muscles: the masseter, the temporalis, the pterygoideus internus, all of whose function it is to close the jaw. Acting as openers are the factors of the external pterygoid action, the action of the diagastric muscle and the natural weight of the jaw. By complicated interaction, the jaw is fixed to aid in the act of swallowing, moves to a varying extent to accommodate the production of speech, and adapts itself to great variations produced by densities of food, yawning, laughter, and so on. The extent of normal opening of the jaw is controlled by the sphenomandibular ligament, the stylomandibular ligament and the short temporomandibular ligaments making up the capsule of the mandibular joint. The latter being weak at the forward aspect, extreme looseness sometimes permits the condyle to slide entirely beyond the articular eminence, producing subluxation of the jaw. The extent of closure of the jaw is determined by the teeth. Since most of the power of the muscles of mastication is applied to the pos-

(Read before the Partial Denture Section at the Seventy-Fourth Annual Midwinter Meeting of the Chicago Dental Society, February 15, 1938.)

terior third of the jaw, most of the impact of chewing is taken by the molar teeth, very little being applied in the incisor district, the mandibular joint acting only as a weak hinge or guide to this movement.

It is not surprising therefore, when molar teeth are missing or the vertical dimension of the jaw is abnormally reduced by a shrinkage of the alveolar ridge beneath plates or by the grinding away of the natural teeth, that the mandibular joint should assume an unaccustomed burden from this district and much of its structure be destroyed. When this occurs, some of the force is thrown into the incisor region, but most of it is referred upward to the mandibular joint in direct line of the vertical dimension of the jaw. Proper regard for this function is the basis for testing the patient for the mandibular joint

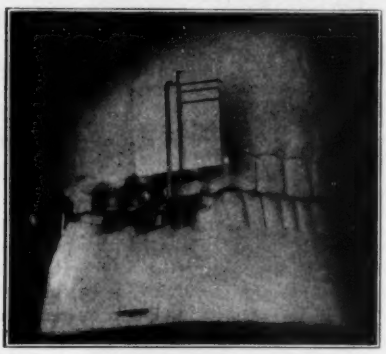

Fig. 1.—Physical rest position.

"syndrome" and is the basis on which the dentist proceeds to restore the position of the jaw.

One of the outstanding faults of hit or miss applications in restoring lost vertical dimension is unbalanced occlusion, resulting in the traumatization of the teeth subjected to the increase in vertical dimension. Not only do the teeth and supporting structures suffer, but there are also cases of interarticular disturbance of the temporomandibular joint resulting in pain and discomfort. The latter result no doubt is due to increasing the vertical dimension beyond the physiologic rest position of the mandible. So, first of all, we must have some means of arriving at the physiologic rest position before attempting to increase vertical dimension.

It is not the purpose of this paper to give a technic for obtaining the physiologic rest position of the mandible, since dental literature contains adequate information regarding this procedure. Suffice it to say that a comfortable position of the mandible can be obtained by a gradual increase of the vertical dimension in those cases wherein the amount of opening necessary would be too great if obtained at once.

An essential factor enters the picture whenever it is desirable to increase ver-

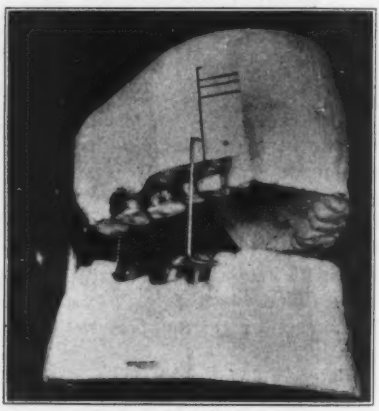

Fig. 2.—Opening mouth before bringing lips in contact.

tical dimension and there are remaining teeth in either arch. These teeth are to be considered carefully as to position in determining the radius to which the splints and completed restorations are to be built.

To make a survey of a given case, I prefer to mount models on the Hall Triplex articulator. The casts, upper and lower, are mounted in their occlusal relationship on this articulator with the opening axis on the plane of occlusion, the incisor guide pin being set at the same time with a two-dimensional or a three-dimensional guide, as the case may be.

If for three dimensions, the ball of the guide-pin is adapted in a cone filled with compound so that the articulator may be moved laterally and protrusively in movements which will allow the cusps to clear. This results in a definite groove for the guide-pin. A two-dimensional guide allows for the lateral and protrusive movements only.

With the teeth in occlusion and the articulator closed, the length of the cusps and incisal edges of the upper teeth are marked on the lower cast. This can be done with a sharp pencil. The upper cast is removed from the articulator and in its place what I call a template surveyor is adapted. This template surveyor is different from an ordinary template in that it can be raised or lowered, or held securely in position, and is so constructed that the cusps and incisal edges of the lower casts may protrude through and not interfere in the survey. The raising or lowering of this surveyor permits a very close study of the cusp and incisal lengths, and allows for the selection of a radius upon which to build comparable to that of the case at hand. For the present, template surveyors are built having a 4, 5 and 6 inch radius, these being the most frequently used.

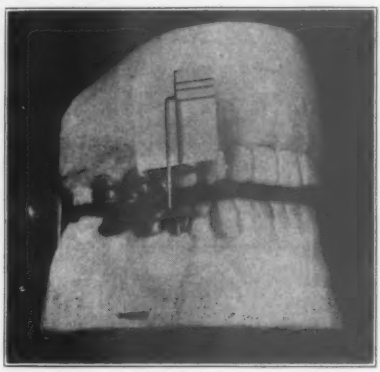

Fig. 3.—Position of stylus when lips are in contact and teeth are not in occlusion.

After mounting and surveying the models as stated, we next obtain the positional relations of the mandible to the maxillae, requisites for further survey and for balancing the occlusion.

Before continuing with this technic, it will be best to give some definitions pertaining to balanced occlusion. These definitions were garnered during the time spent in research with Rupert E. Hall. I have taken the technic that he used in full denture prosthesis for obtaining the positional relations of the mandible to the maxillae and applied it to my procedure when increasing the vertical dimension in mouths not edentulous.

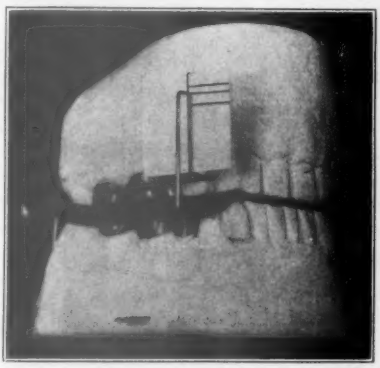

Fig. 4.—Position of stylus when mandible has been closed 1.5 mm. from position of stylus in Figure 3, in which position wax bites are taken.

DEFINITIONS

1. *Occlusion:* Occlusal contact of the teeth, lower teeth against the upper teeth, in the various positional relations of the mandible.

2. *Articulation:* Sliding contact of the teeth from one positional relation of the mandible to another positional relation.

3. *Balanced Occlusion:* Occlusion presenting the greatest possible number of occlusal contacts in any positional relation of the mandible reciprocal with all other relations without interference during articulation.

In order to balance occlusion, it is necessary to occlude the teeth in the positional relations of the mandible and to articulate them to the movements of the mandible.

Positional relations of the mandible are resultants of movements of the mandible. It follows, therefore, that understanding of the movements of the mandible is necessary before proper selection and application of these movements and the positional relations can be made.

The mandible moves in three dimensions, and has, therefore, three component movements: (1) the opening and closing, (2) the anteroposterior and (3) the lateral.

Movements of the mandible are controlled by the temporomandibular articulation (condyle paths) and the occlusion of the teeth. The temporomandibular articulation takes precedence over the teeth because it precedes existence of the teeth, i.e., their eruption, and succeeds them, i.e., their loss. Therefore, for the occlusion to be balanced, it must be synchronized with the condyle paths characteristic of each patient, whereupon the two become harmonious and inseparable, one being equal to the other.

Nature presents two forms of occlusion, cusp tooth occlusion and cuspless tooth occlusion; the former at the beginning of life, the latter, because of wear of the teeth, in old age.

The replacement or restoration of teeth is made both with cusp teeth and with cuspless teeth, through either necessity or choice.

Cusp tooth occlusion requires that the mandible open in order that the occlusion may function; whereas cuspless tooth occlusion does not.

Cuspless tooth occlusion is classified as two-dimensional occlusion, and movement of the mandible associated with it is classified as two-dimensional movement because it embodies the anteroposterior and the lateral component movements of the mandible (two only of the component movements).

Cusp tooth occlusion is classified as three-dimensional occlusion and movement of the mandible associated with it is classified as three-dimensional because it embodies the anteroposterior, lateral and opening component movements of the mandible (all three of the component movements).

The classification of occlusion is based

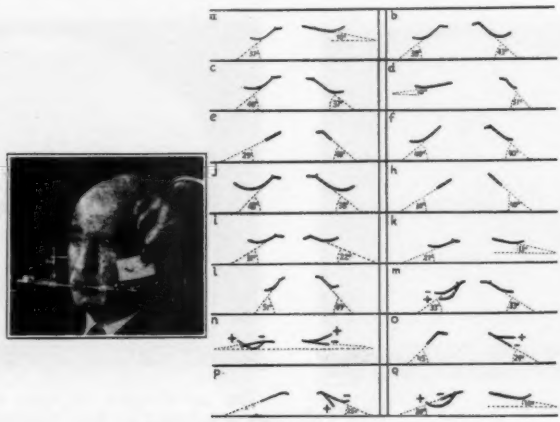

Fig. 5.—Movements of condyle.

on the number of component movements of the mandible involved in the function of each. Conversely, classification of the movements of the mandible is based on the form of occlusion directing them, movement in this case being referred to the incisor point (contact point of the lower central incisors).

Movement of the incisor point referred to the occlusal horizontal plane during lateral movement of the mandible *without* the opening movement (two-dimensional movement) describes a gothic arch

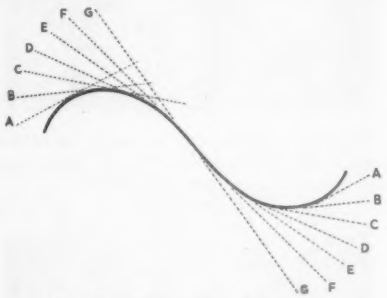

Fig. 6.—Form of condyle path.

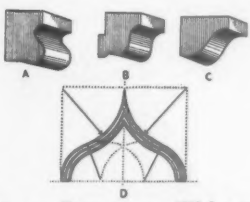

Fig. 7.—Ogee curve. (Webster.)

tracing, familiarly known as the gothic arch movement.

Movement of the incisor point referred to the occlusal plane during lateral movement of the mandible *with* the opening movement (three-dimensional movement) describes an arcuate tracing, which is designated the arcuate movement.

The arcuate movement of the mandible is movement about a central axis. The gothic arch movement of the mandible is movement about a right and left axis (areas). The gothic arch movement is a horizontal forward and sidewise two-dimensional movement.

The arcuate movement is a vertical, a horizontal backward and a sidewise (three-dimensional) movement.

The gothic arch movement has forward or protrusive movement in it, whereas the arcuate movement has backward or retrusive movement in it; these movements being, in this respect, diametrically opposite to one another.

The gothic arch movement is of un-

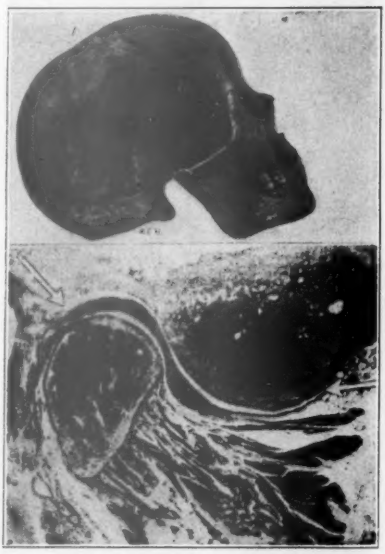

Fig. 8.—Relation of condyle to glenoid fossa. (Prentiss.)

limited magnitude, extending throughout the range of the lateral movement so designated.

In magnitude, the arcuate movement is so limited as to appear as a straight line, ranging between one-thirty-second and one-sixteenth inch to either side, averaging about three-sixty-fourths inch, a total of three-thirty-seconds inch over all. Movement beyond this distance ceases to have any of the retrusive move-

ment in it, and instead begins to incorporate into it the protrusive movements. The point at which the arcuate movement ceases and the protrusive movement begins (gothic arch movement at that opening) is determined by the extent of the retrusive movement of the mandible. At the point where the retrusive movement of the working condyle ceases and the gothic movement begins, the condyle becomes a fulcrum point. It is in this range of movement of the mandible that the occlusion of the teeth functions, a very minute movement. Hall designates this movement "lateral movement of occlusion, and, beyond it, movement of mastication."

Fig. 9.—Embrasure-supported plates (A), with stylus (B) and registration disk (C) in position.

There is a vast difference between gothic arch movement of the incisor point, and arcuate movement of the incisor point, one being two-dimensional movement and the other three-dimensional movement. It is obvious that the requirements for one movement cannot be satisfied with the other movement.

Gysi and Hall agree that the lateral movement of the incisor point is the most important movement of the mandible. In order, then, to establish balanced occlusion in an articulator, it is necessary to register, and to have the articulator record and reproduce, movement of the incisor point that harmonizes with the form of teeth (occlusion) that we employ. For cuspless teeth, (two-dimensional occlusion), we require registrations of two-dimensional relations of the mandible, movement of the mandible *without* the opening movement (gothic arch movement); and for cusp teeth (three-dimen-

Fig. 10.—Equipment necessary to obtain registrations of mandible. Centric and eccentric positional relations are indicated.

Fig. 11.—Author registering arcuate movement of own mandible; result of three-dimensional movement. It is evident that the stylus has traveled a short distance. (Hall technic.)

sional occlusion), we require registrations of three-dimensional relations of the mandible, movement of the mandible with the opening movement included (arcuate movement).

MOVEMENTS OF CONDYLES (CONDYLE PATHS)

The movements of the condyles are variable, for they are not movements of fixed direction. For example, the path, the degree and form of the movement of the condyle vary as the distance within which the condyle moves. This applies then to the mandible as a whole. The form of the condyle path is that of a

Fig. 12.—Author registering gothic arch, result of two-dimensional movement. The wide range of this movement is evident. (Hall technic.)

double or reversed curve formed by the union of a convex and a concave line, much like a flattened letter S.

In architectural and mechanical forms, a double or S-shaped curve is known as an "ogee" curve. This ogee curve of the condyle path is the result of the ogee curve formed by the floor of the glenoid fossa and the eminentia articularis, which guides the movement of the condyle. The form of the condyle path conforms to the form of the glenoid fossa and the eminentia articularis with variations due to the interposed meniscus and action of the muscles considered.

Registration of the lateral relation should be of positions not quite to and never beyond the point where the buccal surfaces of the posterior teeth are flush with one another on the working side. Registration of the protrusive relation should be of the position the mandible assumes when the anterior teeth are flush with one another. This distance varies greatly.

Only those movements and relations of the mandible within the range of the occlusion of the teeth are of interest and value to us in occluding and balancing teeth. Through their use only can we truly effect balance.

Fig. 13.—Hall articulator with four positional relations of mandible recorded in metal molds: C, centric; RL, right lateral; LL, left lateral; P, protrusive.

In order to register movements and relations of the mandible within the range of occlusion of the teeth, it is necessary to have, or to create, occluded teeth, in order to know where to position the mandible when taking check-bites so that the positions used will be those as-

sumed by the teeth. It is only with check-bites so taken that we can hope to balance occlusion accurately to individual relations in an articulator.

In registering two-dimensional positional relations of the mandible or three-dimensional positional relations of the mandible within the range of the occlusion of the teeth, two metal plates are fitted to the lingual surfaces of the teeth just above their greatest diameter. To the metal plates are added embrasure supports. When properly constructed, these remain firmly in position. In the upper plate, a hole is drilled and threaded to fit a screw, the end of which is turned to a sharp point and case hardened. The lower plate supports an interchangeable disk. These disks are made interchangeable because it may be necessary to make more than one series of registrations.

With the plates in the mouth, the screw in the upper plate is set to the desired vertical dimension. The patient is then asked to move the jaw from out in, as in function and under pressure, simulating the act of masticating food, first on one side and then on the other. The tracing will show a modified gothic arch, the apex, in place of being sharp, being

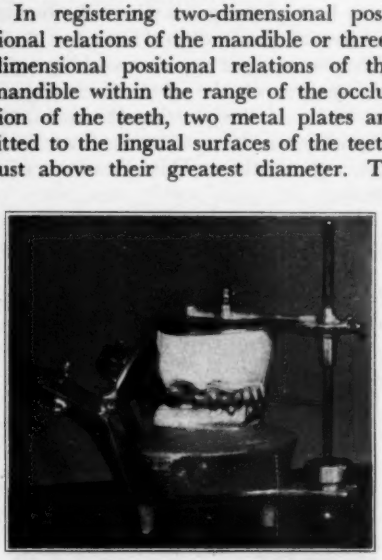

Fig. 14.—Casts mounted with opening axis on plane of occlusion.

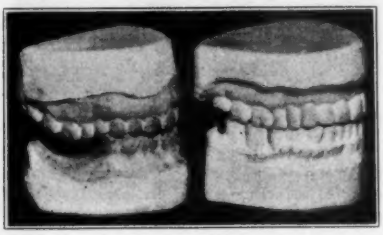

Fig. 15.—Models of case shown in Figures 16-17. This case was one of a well-defined subluxation of the mandible, which was corrected by increasing the vertical dimension 5 mm. in two-dimensional occlusion. Posterior restorations were made, with removable bridgework, using parallel attachments, with porcelain jackets anteriorly. Gold saddles are lined with natural vulcanite rubber and rebased once each year.

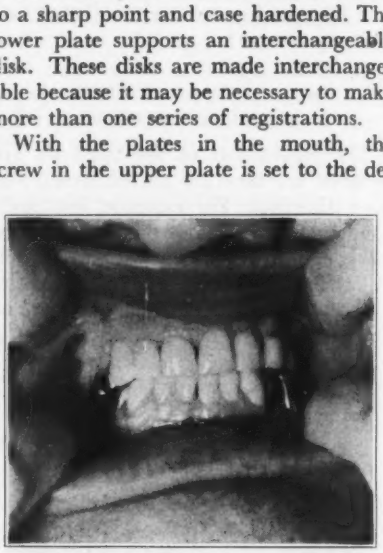

Fig. 16.—Case described in Figure 15. (Compare also Figure 17.)

Fig. 17.—Case described in Figure 15. (Compare also Figure 16.)

rounded. At this point, the patient is asked to protrude and then to retrude the mandible as far as possible. This tracing will bisect the first tracing. It will be noted that the distal termination of the last tracing would form the apex of the customary gothic arch if the legs of the gothic arch were extended. No attention, however, is paid to the point that would be the apex of the customary gothic arch because this is a strained and uncomfortable position. At the intersection of the two tracings, a dent is made with a sharp-pointed instrument. The point of intersection is the centric relation of the mandible.

The dent is used as the center to drill a small hole through the registration plate which positions the point of the screw establishing centric relation.

In order to determine the measurement of the overjet, the patient is instructed to protrude the mandible until the anterior teeth are in end-to-end or flush relation; in which position, the mandible is moved from side to side, scribing a line that intersects the protrusive line, where the hole for the protrusive registration is drilled.

The foregoing are requisites for registering two-dimensional positional relations of the mandible. If it is desirable to register a case in three-dimensional relations, the following is to be added to the aforementioned technic:

The disk which contains the first tracing is removed and another inserted. Before making any new tracing, the screw is turned one and one-half turns, the vertical dimension thereby increasing three-sixty-fourths inch; *i.e.*, one-thirty-second inch to each turn of the screw.

Fig. 18.—Removable bridges; showing lining and its retention on saddles.

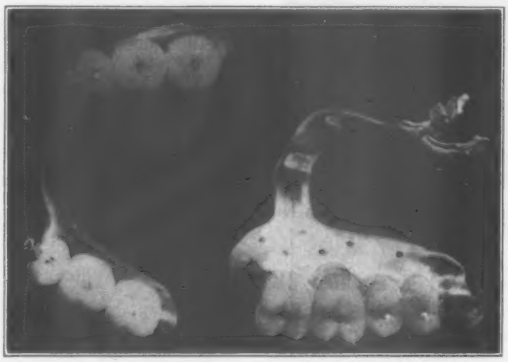

Fig. 19.—Removable bridges; showing lining and its retention on saddles.

The length of the screw is increased three-sixty-fourths inch to allow for opening of the mandible to clear the cusps of the teeth, which is equal to the depth of the cusp, and is the approximate average cusp depth. If there were no cusps on the teeth, it would not be necessary to make a second tracing, because we would have no opening of the mandible to reckon with. With the second disk in position, the patient is requested to make the same movement as before, locating centric position in this vertical dimension. A dent is made in the disk, but no hole is drilled. With a pair of dividers set at three-sixty-fourths inch, this distance is marked off on each leg of the gothic arch from the dent, and holes are drilled the same as the one drilled in the first disk to indicate centric position.

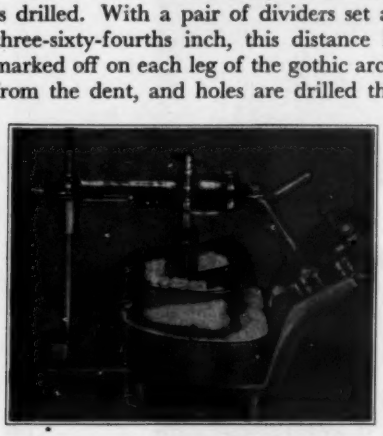

Fig. 20.—Author's surveyor attached to Hall Triplex articulator.

It is seen that this procedure trusts nothing to an articulator for accuracy in producing check-bites of positional relations of the mandible. Furthermore, it is observed that the correct character of mandibular movement is employed in making check-bites according to the form of occlusion being established. Using two registration disks and making registrations in two different planes effects the arcuate movement when an occlusion established according to them is put into function in the mouth. The records made in these respective planes are not functional. Functional movements occur between these two planes.

Having completed the registrations, we are now ready to take check-bites of either two or four positional relations of the mandible to the maxillae, and to position the lower cast accordingly. With the disk in place and the screw set at centric height and resting in the centric hole, a check-bite is secured with stiff plaster of Paris or modeling compound pressed between the two plates. This check-bite is transferred to the cast and articulator, and a metal record poured, etc., until the desired positional relations have been secured and records made.

Fig. 21.—"Grinding in" of splints.

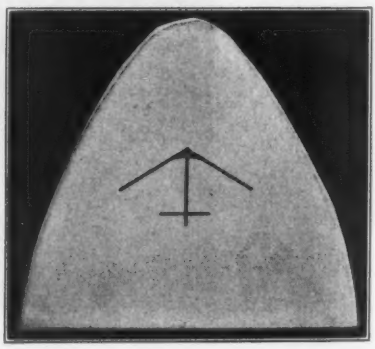

Fig. 22.—Registration disk showing customary gothic arch tracing.

The positional relations having been obtained, the survey completed and a de-

cision made as to radius and type of occlusion to be constructed, the making of splints is next in order. Splints may be removable or fixed. In either case, they are used for maintaining the increased vertical dimension between the maxillae and the mandible during reconstruction of the teeth. They may be used as a temporary means of maintaining increased dimension and where it is desirable to relieve pressure from the condyle head, thus aiding the otolaryngologist in his treatment of ear disturbances.

Splints may be built on upper teeth, lower teeth or both. The only difference in technic will be that, in three-dimensional occlusion, it will be necessary to use the cone filled with compound, having a guide for the incisal pin to travel on which will allow for cusp clearance. Also, the wax will be occluded not only to centric relation and protrusion, but to the right and left lateral positional relations as well.

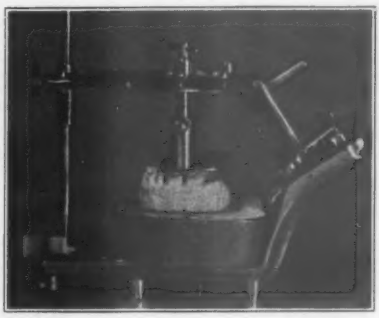

Fig. 23.—Author's template attached to Hall Triplex articulator.

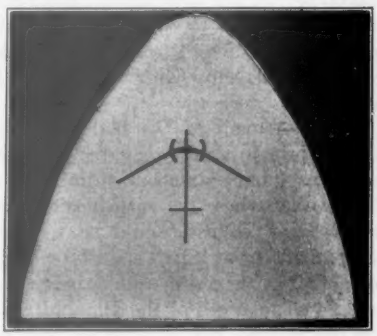

Fig. 24.—Registration disk showing modified gothic arch tracing.

It is my belief that two-dimensional occlusion is preferable in increasing vertical dimension when both upper and lower teeth are to be rebuilt; and that three-dimensional occlusion is preferred where either the upper or the lower arch alone is to be rebuilt and there are cusp teeth in either arch.

If two-dimensional occlusion has been decided on, we begin waxing up the lower arch in centric relation with the guide-pin set as previously stated for this type of occlusion. The upper model is removed from the articulator and in its place a template having the desired radius is attached, being positioned to the height indicated by the surveyor or the amount of height determined on in building the lower wax splints.

After casting, the metal splints are returned to the articulator and discrepancies in casting are checked and corrected with the template still in position. This completed, the template is removed and the upper model replaced on the articulator. The upper is waxed up with the lower splints for the occlusal radius, while the articulator is moved laterally and protrusively. Again, after casting, the upper metal splints are returned to the models on the articulator, and the discrepancies checked, these being minimized by spot grinding when necessary. Carborundum paste is then used between the splints as an abrasive, the articulator is set in motion and a very desirable occlusal contact is the result, a minimum of correction being necessary when the model is placed in the mouth.

Dr. Hall classifies positional relations of the mandible as passive and functional: passive when there is no food

between the teeth and the muscles are not under tension, and functional when there is food between the teeth and the muscles are under tension. He points out further that no articulator, of whatever description, can ever record and reproduce all functional relations of the mandible, because these are variable according to the position of the bolus of food between the teeth and the muscular force exerted. In one case for example, intrusion of the condyle results when the bolus is forward of the point of muscular balance, and extrusion of the condyle when the food is back of the point of muscular balance. This causes torsional displacement of the mandible which it is not possible to register with check-bites or to reproduce in an articulator. Occlusion can be balanced to these relations only by spot grinding functional markings when they develop with the use of the teeth.

This statement of Dr. Hall's confirms my findings in cases treated in my own practice. I have stated on numerous occasions that where the vertical dimension is increased, splints should be worn by the patient for at least a month or longer to definitely establish the passive and functional relations of the mandible. Unless this is done, periodontoclasia may not only be perpetuated, but also all hope of correcting pathosis in the supporting structures of the teeth will be lost.

SUMMARY

I have endeavored to call attention to the fact that dentistry has reached that point of advancement where it not only stands ready to aid the otolaryngologist in the diagnosis of ear syndromes, but also offers scientific, proved mechanical corrective measures for repositioning the mandible. The repositioning of the mandible or increasing of the vertical dimension by rebuilding and lengthening worn down teeth will improve the facial expression. Thus, we are also able to improve the wry physiognomy of a patient whose chin almost touches the tip of his nose.

Lastly, may I reiterate that, in the applications of these mechanical measures, there is little need to jeopardize the teeth in the patient's mouth when increasing vertical dimension provided due consideration is given to obtaining balanced occlusion.

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PHYSICAL PROPERTIES OF DENTAL PORCELAINS*

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VERY little quantitative research has been carried on regarding the comparison of the physical properties of the various types of dental porcelains. This paper is a report of work done on certain commercial dental porcelains, and is to be considered as a report of progress rather than as a finished document for final judgment.

Many properties of these materials offer themselves for study, but, owing to the limited time involved, only three properties have been studied thus far: specific gravity, volume change and modulus of rupture, or transverse strength. The importance of these three properties is considerable. The specific gravity is a measure of the denseness of the fired porcelain; the importance of the determination of volume change during manipulation needs no comment. The value for the modulus of rupture is important as it represents a combination of tensile, compressive and shearing stress in rupture under a static load. The impact strength of these materials was not studied because no apparatus was available at the time. Determinations of this important property are being carried on in this laboratory at the present time.

*Based on a thesis submitted by P. A. Fitzgerald in partial fulfillment of the requirements of Northwestern University Dental School for the degree of Master of Science in Dentistry; first reported before the Louisville Meeting of the International Association for Dental Research, 1936.

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REVIEW OF THE LITERATURE

So far as is known, no one has previously investigated the transverse strength of dental porcelain after firing, although Gill[1] has studied this property in condensed porcelain before firing. Gill[2] has also investigated the specific gravity of certain dental porcelains, and his results are in fair agreement with the present data.

Gill, Clark, Felcher and others have given values for the amount of shrinkage which occurs during manipulation and firing. As far as can be determined from the literature, these values were obtained by direct measurement with a micrometer caliper, a method which we believe to be less accurate than the procedure outlined below. Gill[2, 3] gives values from 7.7 to 19.81 per cent for the linear shrinkage, depending on the manner of condensation and the type of porcelain employed. Clark[4] states that the linear shrinkage varies from 9 to 20 per cent, also accord-

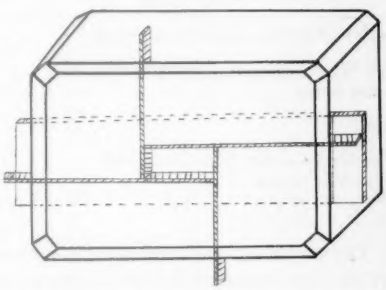

Fig. 1.—Mold employed for condensation of specimens.

ing to the technic and the porcelain used. He is of the opinion that the "average minimum shrinkage" is 10 per cent. Felcher[5] places the shrinkage value of high-fusing porcelain at approximately 14 to 18 per cent, medium-fusing from 15 to 19 per cent and low-fusing porcelain from 16 to 20 per cent. It should be noted that Felcher is of the opinion that the shrinkage increases with decrease in vitrification temperature.

MATERIALS AND METHODS

All porcelains employed were purchased on the open market. The list of materials used is given in Table 1. The products are not listed in the order of the code letters employed in Table 2.

Table 1.—Porcelains Investigated

Trade Name	Manufacturer
Justi high fusing, and medium fusing	H. D. Justi and Son
S. S. White high fusing, medium fusing, and low fusing.	The S. S. White Dental Manufacturing Co.
Apco	American Porcelain Co.
Twentieth Century high fusing, and medium fusing.	The Dentists' Supply Co. of New York

The porcelain was condensed in a mold which was constructed with hydrocal, as shown in the accompanying illustration. The shaded areas represent glass slabs. As may be noted, all of the glass could be removed after condensation, and thus the specimen was left free for transference to the furnace. After forming the mold, the glass slabs were removed, and the hydrocal block was baked at a temperature slightly below 100°C. (212°F.). While it was still warm, it was covered with molten paraffin to be sure that it would not be affected by moisture during subsequent manipulation. Great care was taken to check and recheck the dimensions of the mold throughout the research. The average dimensions were: depth, 3.96 mm.; width, 9.00 mm., and length, 19.88 mm.

All specimens were condensed by the vibration method under as nearly as possible identical conditions as to amount of vibration, water content, etc. The condensation was carried out on an ordinary electric vibrator, which was damped to the proper amount of vibration. A linen towel was employed for the removal of excess water. Distilled water was used throughout.

The specimens were allowed to dry out, and then fired in a standard porcelain furnace. They were laid on a piece of platinum foil which was burnished to a fire-clay slab. A platinum cover was placed over the specimen during firing to insure uniform temperature. The firing method was a modification of that advocated by Gill.[3] Ten minutes was allowed to bring the porcelain to a temperature such that the organic material was burned out, the door of the muffle being left open. A subsequent ten-minute period, with the muffle door closed, was allowed to bring the porcelain to the full-glaze temperature, after which a five-minute soaking period ensued before the current was turned off. This twenty-five-minute firing time was employed for all types of porcelain except the low-fusing porcelain H, when ten minutes was required to bring the porcelain to the full-glaze temperature, followed by a five-minute soaking period. The temperatures employed were

carefully determined for each porcelain by trial bakes before the testing procedure was attempted.

After each specimen had been fired, the muffle was allowed to cool to 1000°F. (537°C.) for the high-fusing porcelains, 900°F. (482°C.) for the medium-fusing and 800°F. (427°C.) for the low-fusing variety with the muffle door closed. After the removal of the specimen and fireclay slab from the furnace, the platinum cover was not taken off until it could be handled with the bare hands without discomfort. This procedure was employed in order to prevent too rapid cooling and the resulting introduction of stresses and crazing.

Every specimen was roentgenographed after firing, and was rejected for test if the slightest defect appeared.

The specific gravity was determined by the water displacement method with the use of a sensitive Jolly balance. Three independent weighings were made of each specimen, and at least three specimens of each type of porcelain were employed. The results were averaged. The volumes of each specimen were computed as a part of the foregoing test, and the volume shrinkage was determined by a comparison of the volume of the fired specimen with the volume of the mold.

The modulus of rupture, or transverse strength, was obtained by applying the load at the center of the specimen, which was supported at each end by steel wedges pivoted on ball bearings. All dimensions were measured at five different locations by means of a micrometer caliper, and averaged. After blotting paper had been placed between the specimen and all metal parts in order to compensate for surface irregularities, the load was applied by means of a steel wedge fastened to the crushing head of a testing machine which was accurate to 1 pound avoirdupois. The head was moved at the rate of 0.25 mm. per minute until fracture occurred. The transverse strength was computed in the usual manner.[5]

TABLE 2.—PHYSICAL PROPERTIES OF DENTAL PORCELAINS

Porcelains	Specific Gravity	Volume Shrinkage (Per Cent)	Transverse Strength (Lb./Sq. In.)
High fusing			
A	2.32	32.2	7,800
B	2.33	31.7	7,900
C	2.32	32.3	8,200
Medium fusing			
D	2.30	32.6	7,100
E	2.32	34.6	8,300
Low fusing			
F	2.29	39.5	3,700
G	2.32	33.3	7,700
H	2.50	37.4	7,000

COMMENT

The data are presented in Table 2. The difference between various trials for the determination of each property was surprisingly small, with the exception of the data obtained for the transverse strength of porcelain F. Six trials were made for this property in the case of this porcelain, and the strength varied from 2,051 to 6,077 pounds per square inch for different trials. Inquiries concerning the nature of the powder warrant the conclusion that a segregation of the constituents had occurred before condensation. This particular porcelain is not fritted in a single mass by the manufacturer, but, rather, certain ingredients are mixed together in a ball

mill and marketed in this condition. The powder from which these specimens were made had been sitting on the laboratory shelf for several years and thus segregation possibly took place. In further confirmation of this fact, we were forced to classify this porcelain as low fusing instead of medium fusing as claimed by the manufacturer. Such irregularities lead one to doubt the efficacy of the manufacturing process.

As may be noted, the specific gravity of the various porcelains is not, in general, dependent on the firing temperature as all the porcelains, except H, exhibited almost the same value for this property. Evidently, porcelain H contains a heavier element than do the others, or else the shape and size of the powder particles are a factor.

There can be no doubt of the fact that the volume shrinkage is somewhat affected by the firing temperature. The general tendency as exhibited by the data is for the lower fusing porcelains to shrink more than the high fusing. However, low-fusing porcelain G is an exception to this rule. As may be noted from Table 2, the volume shrinkage of this porcelain is but little greater than that of the high-fusing varieties. According to the manufacturer of this product, the pyrochemical reactions are completed before the porcelain is ground. In firing, the dental ceramist merely softens the powder particles sufficiently to obtain cohesion. Such a firing procedure is apt to be critical in control, but evidently considerable shrinkage is avoided in comparison to that of the other low-fusing varieties.

The cause of the variation in shrinkage between the various porcelains may be due to composition and/or shape and size of particle. It should be remembered in this connection that the condensation method was constant for all porcelains.

The linear shrinkage is, for all practical purposes, one-third of the volume shrinkage. Comparison indicates that both Gill[2, 3] and Clark[4] are low in their estimate of the minimum shrinkages which occur. Furthermore, the differences in shrinkage between the various groups according to fusion temperatures is not so great as those indicated by Felcher.[6]

Any interpretation of the data concerned with the values for the transverse strength in terms of clinical application must be made conservatively, as the forces involved in this test are static, and the fracturing stresses involved in the mouth are generally of the impact type. However, in terms of static stress, it may be noted that there is not a great amount of difference between the strengths of the various porcelains, if porcelain F is excluded from consideration, for reasons before stated. It is the common opinion among dental ceramists that the low-fusing porcelains are less strong than the higher-fusing varieties. As far as the present data are concerned, low-fusing porcelain G compares equally well with any of the high-fusing porcelains in every respect.

SUMMARY AND CONCLUSIONS

Eight dental porcelains have been tested for specific gravity, volume shrinkage and transverse strength. As far as the data observed are concerned, it is concluded that:

1. In general, there is little difference between the values for specific gravity of the various porcelains under identical conditions of condensation.

2. The shrinkage of the low-fusing porcelains is, in general, greater than that of the high-fusing variety, although one exception was found, i.e., porcelain G.

3. The transverse strength of dental porcelains does not depend on the firing temperature to any practical degree, under identical methods of condensation.

4. The process of manufacture of dental porcelains may be a determining factor in their reliability for uniform results in firing. The process should be such that

no segregation of the powder particles can occur at any time.

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A CASE OF UNUSUAL SUSCEPTIBILITY TO GINGIVITIS AND GENERAL STOMATITIS

By Benjamin Tishler, D.M.D., Boston, Mass.

An interesting and unusual case, the chief characteristic of which is the tendency of the patient to develop gingivitis and general stomatitis was referred to me several years ago for diagnosis and has been under observation ever since because of two recurrences. The patient, a rather frail woman of 38, is accustomed to spend the winter months in Florida. Previous to December 1933, she resided in a small city, but at that time decided to change to a larger one and soon afterward noted symptoms of discomfort and soreness of the entire oral cavity. According to her description, the areas responsible for the discomfort and soreness were located on the maxillary and mandibular gingivae, the buccal mucosa, the frenum of the tongue and the mucous membrane over the submaxillary glands. The throat was affected also, and marked discomfort resulted when drinks, such as orange juice, were swallowed. Eating morsels of meat had the same result, and the patient noted that both submaxillary glands were tender to touch. A characteristic of the sore areas was that they appeared in various locations, healed spontaneously and then developed in others. At no time was the mouth completely free from them.

The patient consulted a local dental practitioner, who evidently overlooked the general oral condition and diagnosed the gingival symptoms as "pyorrhea." He advised her to rub a proprietary medicament sometimes used in the treatment of Vincent's infection on the gingivae. As no improvement resulted, another practitioner was consulted, who made a diagnosis of Vincent's infection and recommended a continuance of the use of the medicament. As this produced no change, on her return to Boston in the spring, the patient visited her physician and was in turn referred by him to a local dental practitioner for treatment. As no improvement resulted, she was sent to me for a diagnosis.

An examination of the mouth and gingivae revealed a gray exfoliated area which involved the entire cervical margin of the left inferior first molar, about 3 mm. wide and extending into the pericementum. There was a much smaller area on the alveolar gingiva of the approximating second bicuspid. No inflammation which might be responsible for

the general tenderness present in the oral cavity was noted. However, there was a moderately advanced periodontal pathosis present, which was not considered a factor in the symptoms of which she complained. As the interdental papillae were not ulcerated and the exfoliated area was not tender to touch, and the case showed none of the characteristics of Vincent's infection, no smear was taken. When a pledget of cotton was gently rubbed over the gray areas, the exfoliated tissue was easily removed and normal tissue was revealed beneath. As can be understood, no bleeding resulted.

It was evident that the trouble was not of dental origin, so the patient was questioned regarding her diet. It was learned that her physician had, because of an intestinal disorder, advised a special diet consisting of little meat and plenty of fresh vegetables, with 16 ounces of orange juice and 4 yeast cakes daily. She neither smoked nor drank alcoholic liquors. On further questioning, it was learned that, for three months, there was a tendency to regurgitate after eating the yeast cakes because they had become very distasteful. As it seemed that a definite aversion to a particular kind of food might have some influence in the case, on my suggestion her physician advised a discontinuance of the yeast for a time to note the result. He also advised the same for the orange juice, although I did not consider it to be a factor. The patient was discharged and instructed to return in a week for an examination. At that time, a marked improvement was noted, and four days later the oral discomfort had disappeared, so that foods of all kinds could be swallowed. Two weeks later, the patient resumed the drinking of orange juice daily. Treatment of the periodontal condition was begun at this time and carried to completion.

The patient returned to the south the following winter, but returned to Boston in March 1935, unexpectedly breaking into her vacation period. She complained of soreness under the tongue and on the right and left buccal mucous membrane. The gingivae were not involved at this time. (It is interesting to note that she had eaten yeast cakes on her return south, but, as the general oral discomfort developed again, she discontinued them, with the result that the discomfort ceased.) As none of the symptoms noted at this time was of dental origin, a thorough physical examination was recommended to determine whether any systemic factors were involved. The patient was accordingly referred to a specialist for allergic tests. She was later referred to a diagnostician, who sent her to a Boston hospital, where she remained a week under observation and was subjected to further tests.

The reports of the medical examination showed that nothing was radically wrong. The allergic tests disclosed the fact that such foods as cabbage, broccoli and beans were contraindicated and lettuce should be eaten in very small amounts. The patient was advised to drink milk and cream and a moderate amount of orange juice. The soreness gradually disappeared.

She returned to Florida in December 1935, and on March 2, 1936, appeared at my office once more for advice and treatment, breaking into her winter vacation again because of a repetition of the oral discomfort, the onset of which began ten days previously; and which was so severe that no solid foods could be eaten in comfort. In addition, a marked gingivitis was noted which was not present on any of the other visits. The tissue was congested, the condition being confined mostly to the area between the right maxillary third molar and the cuspid on the same side. The gingivae were turgid, dark red and extremely sensitive to touch. The congestion involved the marginal and cemental areas. There was a less

marked interdental area between the maxillary central incisors and another beneath the tongue. The patient reported that the initial area was noted between the second and third molars. The right buccal mucous membrane was also affected, and there were three so-called canker sores in the alveolar gingivae of the right molar region. No inflammatory areas were noted in the remainder of the oral cavity, nor were the lingual surfaces of the gingivae involved anywhere. An interesting fact of the case was that the patient decided to boil the water which she drank on the train during her journey to Boston, with the consequence that the condition became less marked.

With the thorough medical examination of the previous year as a background, it seemed that the drinking water might be a factor, and after the examination, the patient was advised to return to her home and was instructed to eat the usual food and drink the water there. The use of a mouthwash of one-quarter teaspoonful of sodium bicarbonate in a half glass of water several times a day was recommended to assist in alleviating the discomfort, and instructions were given to report in a week unless the condition became worse. An examination of the mouth at this time showed that it was completely healed except for a very slight area between the right upper first and second bicuspids, which it was believed would soon be well. The patient was discharged and advised to drink bottled spring water after she returned to the south a few days afterward. A letter received from her later stated that no symptoms had developed up to that time.

The patient was last seen in July 1937 and reported no recurrence of her former trouble during the preceding winter (1936) and spring (1937) in the southern city. However, at one period, she discontinued drinking the bottled spring water and drank the water which was served at the hotel. The previous oral symptoms developed five days afterward, at which time she began to drink the bottled spring water again, with the result that the soreness disappeared in a few days.

This case presents some interesting points. It is not definitely known what was responsible for the soreness which developed after the eating of the yeast cakes, which were discontinued during the first visit in 1933, since they were not included in the diet when the allergic tests were made in March 1935. However, the fact remains that soreness developed when they were eaten later and disappeared after they were discontinued. The thorough physical examination that the patient received during the second visit excluded the possibility of a functional disturbance or food allergy; and the definite proof that the water drunk in the larger city was responsible for the lesions noted on the third visit indicated that an idiosyncrasy was responsible, since the change in drinking water eliminated her symptoms. There is a possibility that it might have been responsible for the symptoms noted in 1934 and 1935, which was not considered at that time by the physician. However, thousands of persons who visit the same city as this patient does, some of whom are my patients, are drinking the water served there, but no other case of this kind has ever been seen by me nor have I ever noted a similar case reported by another.

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IMMEDIATE DENTURES

By Luzerne G. Jordan,* D.D.S., Washington, D.C.

IMMEDIATE denture service implies the insertion of a previously constructed prosthetic appliance immediately after the extraction of the natural teeth which it is to replace. Such service may include fixed bridgework and full or partial dentures, but this paper will be limited primarily to a consideration of immediate full denture service.

There is no greater satisfaction to be derived from full denture construction, both to the patient and to the operator, than that resulting from the immediate insertion of full dentures. The general trend is toward this type of denture practice, owing primarily to a desire on the part of the dentist to render a superior type of full denture service and also to the rapidly advancing demands of the public. There are those exceptional cases, of course, wherein immediate full dentures might not be advisable, but the majority of patients would be much better served by this method of practice. I believe that the day is not far distant when the majority of first full dentures will be of the immediate type, and that the prosthetist who insists on delayed denture service will find his patients going elsewhere for their dentures.

Earlier teachings on this subject are no doubt partly responsible for the fact that many dentists have hesitated to enter on this very gratifying phase of prosthetic practice. Too often, the technics presented included the retention of all remaining natural teeth until the full denture had been constructed, when all the teeth were extracted at one sitting. Together with this, great emphasis was placed on the exact duplication of natural tooth form, and of position and arrangement in the artificial denture. In most instances, the student was left with the impression that rather extensive alveolectomy was essential when immediate dentures were to be constructed. In modern practice, these procedures are more often the exception than the rule, and it has been found advantageous to extract all remaining posterior teeth in jaws to be supplied with full dentures, and to permit the ridges to heal before starting denture construction. By this method, the greater portion of the ridge which is to receive the immediate denture will be in condition to provide comfortable denture support, especially in the regions of heaviest occlusal stress. This is particularly true of the lower jaw where the principal support is obtained from the crest of the ridge. The absence of posterior teeth also makes it possible to secure better impressions for use in full denture construction.

Extensive alveolectomy in preparation for full denture construction, either immediate or delayed, is no longer considered good dental practice. One of the chief concerns of the prosthetist is the preservation of edentulous ridges, and therefore surgical reduction of the osseous structures should be limited to actual necessity.

The arrangement of the artificial teeth should follow the general principles that apply to any full denture construction. It is not always advisable to duplicate natu-

(Read before the Section on Full Denture Prosthesis at the Seventy-Ninth Annual Session of the American Dental Association, Atlantic City, N. J., July 14, 1937.)

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ral tooth position or arrangement in the artificial denture. To do so would very often result in instability and faulty function of the denture.

The retention of the natural anterior teeth until the denture has been completed aids materially in the selection and preparation of the artificial substitutes and, in the majority of cases, may serve as a guide in their arrangement. It must be remembered, however, that full artificial dentures function under conditions entirely different from those associated with natural dentures, and immediate full dentures are no exception.

There are three principal types of cases for which immediate full dentures can be constructed:

A: Immediate full dentures for each jaw.

B: One immediate full denture to occlude against a partial complement of natural teeth and a partial denture which is being constructed at the same time.

C: One immediate full denture to occlude against a full complement of natural teeth in the opposite jaw.

The case selected for description here required an immediate full denture and a partial lower denture (Type B). The details of the partial denture construction will be omitted except as it may influence the full upper denture procedure. Variations in technical procedures for the other types of cases will be mentioned in proper order.

PROCEDURE

The most important phase of any dental operation is the examination and diagnosis, and yet many failures in all types of dental service may be traced to neglect in this important procedure. The examination should include roentgenograms, a record of the visual oral examination, well-made study casts and careful consideration of the patient's general physical condition. The results of the diagnosis should be carefully explained to the patient and a complete understanding between patient and dentist be arrived at before any operative procedures are started. The patient should be informed regarding the difficulties associated with the wearing of full dentures, such as those arising from tissue changes and the need for frequent servicing, such as rebasing, and the advisability of having new dentures made when needed to meet esthetic requirements and maintain occlusion. Proposed changes in anterior tooth position or arrangement should also be understood.

PREEXTRACTION RECORDS

Preextraction records consist of three parts, the facial profile record, modeling compound impressions of the anterior teeth and an impression of the labial surfaces of the anterior teeth with the posterior teeth in occlusion.

The natural teeth when extracted are seated in the modeling compound impressions and plaster is poured around the roots to form a cast for future reference. A cast made in the labial surface impression demonstrates the overbite and overjet present in the natural tooth arrangement. The profile record card is made by first adapting a piece of fuse wire to the profile of the face, and cutting the card to the resulting outline. (Fig. 1.) A straight edge is placed against the incisal edge of an upper central incisor and held firmly against the card, while a line is drawn along its surface. Pointed dividers are set at a given distance (recorded on the card) and one point is placed on the labial surface of the upper central incisor, while the other point is allowed to scribe an arc across the line already drawn on the card. The horizontal line serves to guide the operator in establishing the correct length of the anterior teeth, and the vertical line guides him in the anteroposterior positioning of these teeth. Previous to making the profile record, it should be decided whether an increase in the degree of opening would be advisable. If an increase is deemed advisable, it should be established

by placing wax or compound between the posterior teeth.

Preextraction records serve a valuable purpose. In delayed full denture construction, they serve as a guide as to anterior tooth form, position and alinement, and also the correct degree of opening. In all full denture service, the profile record may later be used to demonstrate to the patient those changes which have occurred over a period of time and which indicate the need of new dentures and serve as a guide in their construction.

Pleasing results attained in any full denture construction when preextraction records were not available should be registered with a profile record so that the results can be duplicated when new dentures are made at any future date.

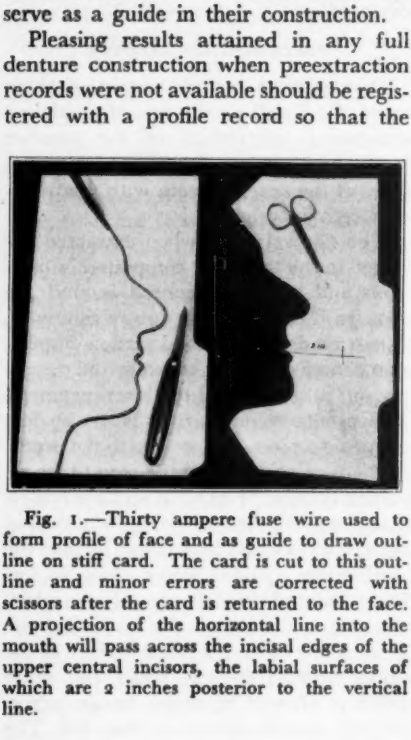

Fig. 1.—Thirty ampere fuse wire used to form profile of face and as guide to draw outline on stiff card. The card is cut to this outline and minor errors are corrected with scissors after the card is returned to the face. A projection of the horizontal line into the mouth will pass across the incisal edges of the upper central incisors, the labial surfaces of which are 2 inches posterior to the vertical line.

PREPARATION OF THE MOUTH

All posterior teeth should be extracted in jaws which are to receive full dentures. In some instances, it may be advisable, for esthetic reasons, to leave the first bicuspids in position until the denture has been completed and remove them at the time the anterior teeth are extracted. Changes of posterior ridge form should be made, where indicated, when the posterior teeth are extracted. Movable pads of soft tissue sometimes found in the third molar region of the maxillary ridge should always be removed. Unopposed maxillary posterior teeth usually extrude (move downward) with the ridges which surround their roots. When the teeth are later extracted, the ridge is found to present undesirable tuberosities, which encroach on the intermaxillary space to such an extent that they prevent proper denture construction. Such malformations should be reduced both in vertical and in horizontal dimensions at the time of extraction.

Rounded lateral extensions which present undercuts on one or both sides of the mouth do not necessarily require removal. The future positioning of the artificial teeth in these areas should be the guiding factor. It is much better to preserve the osseous supporting structures and alter the finished denture slightly, to permit its easy insertion and removal. This is accomplished by cutting away the inner surface of the buccal or labial flange which enters the undercut without altering the vertical height of the denture borders. Some operators erroneously reduce the vertical height to the level of the tuberosity. This procedure is wrong, because the seal against the soft tissues at the border of the vestibule is broken, and denture retention is lost. Undercuts occurring on one side of the mouth only are often overcome by rotating the denture when seating or removing it.

All operative procedures on or about the natural teeth in Type B and C cases should be performed as soon as the soft tissues in the posterior part of the mouth have passed beyond the initial healing stages. This may include such operations as fillings, placing fixed bridges, periodontal treatment and the establishment

of proper occlusal form and tooth alinement.

Occlusal form and natural tooth alinement are important factors in the future establishment of balanced occlusion. It is a recognized fact that balanced occlusion between upper and lower full dentures is essential to proper function, comfort and efficiency, and yet many operators will construct single full dentures to occlude against natural teeth which present an occlusal alinement that makes balanced occlusion impossible.

Both occlusal form and tooth alinement should, if necessary, be altered by grinding or by restoration, so that the resulting cusp inclines and anteroposterior alinement is in keeping with the requirements of balanced occlusion in that particular mouth.

IMPRESSIONS

There are two principal types of impressions to be considered in immediate full denture service: (1) those of jaws which are to receive the full denture and (2) those of the opposing jaw where natural teeth are to remain.

Impressions of jaws receiving full dentures should be made without undue compression of the soft tissues and should include a true copy of the outline and contour of the relaxed buccal and labial vestibules. In other words, they should be properly muscle-trimmed in both the buccal and the labial region. The posterior border of upper impressions and the mylohyoid ridge areas of lower impressions should be slightly overextended. These overextensions are not included in the finished dentures.

Of all the impression technics available for this purpose, I have found the zinc oxide and eugenol paste materials, in an especially prepared tray with a plaster of Paris labial section, to be the most satisfactory.

Regardless of the technic to be used, the operator should secure a good preliminary impression and make a stone cast for use in preparing the special impression tray. The preliminary upper impression should be scraped down about one-eighth inch in the hard area and, if desired, that portion of the impression representing the lingual surfaces of the natural teeth may also be scraped slightly. The approximate limits of the proposed final impression tray are marked on the stone cast.

The shellac base-plate commonly used in denture construction can be made to serve for the special impression tray by adapting a sheet of this material to the cast in the usual manner, and by rolling the buccal borders back on themselves to the pencil outline on the cast. The material is allowed to extend along the lingual surfaces of the teeth and is bent at the incisal edges to extend anteriorly (Fig. 2), forming a shelf approximately one-half inch wide beyond the labial surfaces of the teeth. Rigid impression trays are essential to accurate impressions, and for this reason another sheet of base-plate material should be adapted over the first; or modeling compound may be added to provide the necessary rigidity.

Fig. 2.—Impression trays made by adapting temporary base-plate material on preliminary casts. Modeling compound is added to provide rigidity.

The buccal borders of upper trays should be formed or carved to present a flat shelf about 3 mm. short of the border of the vestibule and of a width in keeping with the width of the vestibule. The posterior border should be overextended about one-quarter inch. The upper tray is also provided with a hole in the anterior

region of the palate to permit easy escape of the impression material in that area. Previous to impression making, the tray is tried in the mouth to check border limits and stability. Errors in border extension should be corrected by adding to or reducing the tray.

LOWER IMPRESSION TRAYS

Lower impression trays are made in practically the same manner as upper except that the buccal borders should be formed to the exact limits of the vestibule outline. In other words, these trays should not present underextended buccal borders as do the upper trays. In the mylohyoid region, the tray should extend slightly below the mylohyoid ridge in a vertical direction, but should not enter the under

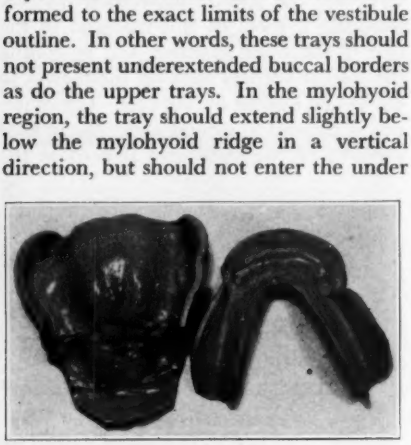

Fig. 3.—Tissue surface of special upper and lower impression trays. A small hole is placed in the anterior region of the palate and the surface of both trays are scratched to assure firm attachment of the impression material.

cut. A piece of heavy iron wire is used, together with modeling compound, to give the tray proper rigidity.

MAKING THE IMPRESSION

The trays are dried and fine lines are scratched into the tissue surface with a sharp knife. (Fig. 3.) The impression material is prepared according to directions and placed in the tray, which is then firmly seated in the mouth. At the proper time, the cheeks are manipulated to allow the desired tissue trimming of the borders. When hardened, this portion of the impression is carefully removed from the mouth and inspected. If discrepancies occur, it is advisable to remove the impression material and repeat the procedure. Excess material is trimmed away in the anterior region as for a sectional compound impression. This portion of the impression is returned to the mouth, where it is tested for stability. It is then rigidly supported in position by the patient or assistant while the operator distends the lip and places a generous amount of quick-setting plaster against the labial surfaces of the teeth and gums and well into the labial vestibule, making sure that this material joins that portion of the impression already completed.

The lip is brought downward or upward, as the case may be, over the plaster and gently manipulated by the operator to assist in the proper recording of the labial vestibule. Considerable care should be exercised when recording the borders of the buccal and labial vestibules, because the retention of full dentures depends to a great degree on their border contact with the soft tissues in these areas.

Before removing the plaster section, the anterior portion of the entire impression should be thoroughly chilled with cold water to prevent warpage on removal.

In some cases, the plaster section will come away in one piece; in others, it will be necessary to fracture it in the median line. The remainder of the impression is then removed from the mouth and assembled for inspection.

Upper or maxillary impressions should be treated as follows: The roof of the mouth is carefully examined and, with an indelible pencil, the hard area that is to be relieved in the final denture is outlined. Stereotyped outline forms should be avoided. Very often, the relief area established in finished dentures is entirely too broad. The posterior border of a maxillary full denture base should emerge from the posterior limits of the upper border of the buccal vestibule, pass

around the posterior tuberosity of the maxilla and lie in the groove between it and the hamular process. It then passes out onto the palate to lie along the hinging line between the movable soft palate and the hard palate. With the aid of the edge of a mouth mirror the groove between the hamular process and the posterior tuberosity of the maxilla on each side of the mouth is located, and also the line along which the soft palate hinges in function, by having the patient say ah several times. These landmarks are outlined with an indelible pencil and the base portion of the impression is returned to the mouth for transfer of these markings to its surface. The impression is now removed from the mouth and a very fine line is scratched into the surface of the impression along these markings. The various sections of the impression should be carefully cleaned and assembled, and the parts locked together with sticky wax. The plaster of Paris section is then varnished to present a glossy surface.

IMPRESSIONS OF OPPOSING JAWS NOT REQUIRING FULL DENTURES

Impressions of jaws presenting a full complement of natural teeth need not include more than the occlusal half of the posterior teeth and slightly more of the anterior teeth. Extreme accuracy is essential to assure proper occlusion in the finished denture. Such impressions may be made entirely of plaster, and a low-fusing metal model be poured; or modeling compound may be used in the following manner: A shallow orthodontia-type tray of proper size and shape is filled to slight excess with modeling compound. A shallow imprint of all teeth in the arch is made and the impression removed from the mouth and thoroughly chilled. All excess is trimmed away, only a shallow imprint of each tooth remaining on the surface. With a needle flame, the surface of the impression over the tooth indentations is heated to a shallow uniform depth, tempered in hot water and returned to the mouth. The impression is seated in its original position with considerable force, thoroughly chilled and removed. It will be found that this impression presents considerably more detail than that presented by most other types, and, when properly boxed and filled with artificial stone, will afford a very useful cast for this and other types of prosthetic service.

In the case illustrated, the opposing jaw required a partial denture, and a sectional compound impression was made.[1]

BOXING IMPRESSIONS FOR IMMEDIATE FULL DENTURES

In partial denture construction, it will not be necessary to retain a record of the vestibule in the labial region, because this area would not be involved in the construction of the prosthesis.

The opposite is true of immediate dentures, however, and the same care should be used in placing the boxing shoulder on immediate full denture impressions that is used in regular full denture construction. Side wall boxing should be of sufficient height that a cast at least one-half inch thick at its shallowest point results. Before filling with a thick mix of artificial stone, the entire assembly is placed in a pan of room temperature water to satisfy the hydroscopic action of the plaster section.

CASTS FOR PARTIAL DENTURE CONSTRUCTION

In the case illustrated, the teeth are of silver amalgam and the remainder of the cast is of artificial stone.

MAXILLARY CAST AND BASE-PLATE

When the impression is removed from

1. JORDAN, L. G.: Sectional Compound Impressions in Partial Denture Construction. J.A.D.A., 25:401, March 1938.

the maxillary cast, it will be noted that the grooves scratched in the impression appear on the cast as shallow ridges, which, of course, mark the outline of the hard area and posterior border. A piece of relief metal of proper thickness is burnished over the hard area on the cast and trimmed to the outline then evident on its under surface. This outline ridge is carefully scraped away and the relief metal cemented to the cast with household cement. The cast should now be duplicated to provide an exact copy in artificial stone. The duplicate cast is set aside for use later when the artificial teeth are arranged. A sheet of temporary base-plate material is adapted to the cast, care being observed that it is well packed in the buccal grooves which represent the borders of the future denture. It is trimmed to the gingival outline of the natural teeth on the palatal surface, and the posterior border is trimmed to the outline represented by the shallow ridge on the cast. This ridge is now carefully scraped away and the base-plate is ready for trial in the mouth.

MANDIBULAR CAST AND BASE-PLATE

If the lower jaw is to be supplied with an immediate full denture, temporary base-plate material is adapted over the ridges and made continuous around the lingual surface of the teeth and gums. Heavy wire is formed to the arch outline, heated and firmly attached to the base-plate. Modeling compound may also be added to increase rigidity. These base-plates are used only for making jaw relation records, attaching the casts to the articulator and adjusting the condyle guides.

In the case illustrated, the lower jaw required a partial denture; therefore, the metal framework has been constructed and tested in the mouth and temporary base-plates have been firmly attached to it.

CHECKING MAXILLARY BASE-PLATE AND POST-DAM

The posterior border of the maxillary denture base as previously described should be located according to definite anatomic landmarks and is checked for proper extension by rubbing the lead of an indelible pencil along the tissue surface of the border, and seating the base-plate in the mouth where the indelible mark will be transferred to the surface of the mucosa. The base-plate is removed and the location of this transfer noted in reference to the anatomic landmarks. Any necessary alterations are made by adding to or taking from the border of the base-plate. The buccal borders are also carefully checked for proper extensions.

The base-plate is returned to the cast and modeling compound used to attach one-half a tongue depressor to the anterior palatal area, extending anteriorly over the incisal edges of the teeth, where it may serve as a lever in testing the retention of the posterior part of the base-plate. When pressure is applied in an upward direction on the lever, the base is liable to drop in the posterior portion. The base-plate is returned to the cast and, with a sharp knife, a groove about 1 mm. is cut deep in the surface of the cast, with the posterior border of the base-plate as a guide. The base-plate is again removed and the cast scraped from the bottom of the groove anteriorly. This altered area should not encroach on hard or unyielding tissues in the mouth. In the region of the groove, the affected area should be well-rounded and approximately 2.5 to 3 mm. wide.

Between the maxillary ridge and the midline, the affected area becomes wider toward the anterior aspect. At the midline, it is again narrower to avoid encroachment on the hard area. The union of the scraped area with the palate or ridge anteriorly should not present a definite line of demarcation. (Fig. 4.)

The base-plate should now be softened

along its posterior border and adapted to the altered areas, chilled, trimmed and returned to the mouth. The lever is used for testing. Insufficient post-dam in local areas is usually indicated by small bubbles moving in and out under the border of the denture. Such areas should be deepened on the cast, and the base-plate again adapted. The high degree of perfection usually attainable by this post-dam procedure in regular full denture construction cannot be expected when natural teeth are present in the arch. I learned of this post-dam technic from Ewell Neil several years ago, and have found it a very satisfactory procedure.

OCCLUSAL RIMS

Occlusal rims are made of modeling compound or hard wax with the patient present. If the lower jaw is to receive an immediate full denture and presents edentulous areas, these areas are supplied with occlusal rims presenting the approximate position and alinement that will later be assumed by the artificial teeth. The union of buccal and lingual surfaces with the occlusal surfaces should be angular and not rounded. The maxillary rim is then formed of softened material and attached to the base-plate along the posterior ridges and across the anterior region of the palate, where it will oppose or make contact with the lower anterior teeth when the jaws are closed.

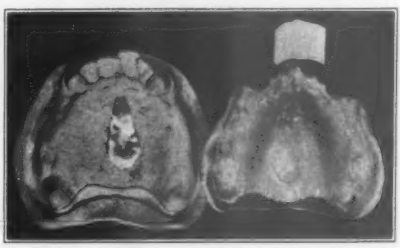

Fig. 4.—Completed post-dam procedure.

While the upper rim is yet soft and pliable, the upper assembly is taken to the mouth, where any necessary changes are made in the alinement to assure contact with the teeth and rims in the lower jaw. The patient is allowed to close into the semirigid upper rim until the desired degree of opening is established. This may be revealed by the relation of the remaining natural teeth, or by the previously made profile record. The upper assembly is then removed from the mouth and all excess rim material trimmed away. It is again checked to be sure of the degree of opening. In the case illustrated, the natural teeth, metal framework and occlusal rims supplied the occlusal surfaces of the lower jaw.

THE ARTICULATOR

Only an adjustable articulator should be used in any phase of denture construction.

THE FACE-BOW RECORD

The face-bow record is a record of the positional relation existing between the maxillae, the maxillomandibular axis and the condyles, when the last are in their most retruded rest position in the glenoid fossa. For all practical purposes, the emergence of the maxillomandibular axis upon the surface of the face may be accepted as being one-half inch anterior to the tragus of the ear, on a line toward the corner of the eye. The face-bow record enables the operator to orient the maxillary cast in the articulator in its correct relation to the maxillomandibular axis.

CENTRIC RELATION RECORD

The mandibular cast is mounted in the articulator by means of an unstrained centric jaw relation record made in the mouth. In the case illustrated, this is accomplished in the following manner: The height of the maxillary occlusal rim is reduced about 3 mm. throughout its entire length. A roll of very soft compound

or non-greasy wax is sealed to the surface of this rim. This material is shaped into a triangular form with the apex positioned to contact the buccal third of the lower occlusal rim and incisal edges of the lower anterior teeth. While uniformly soft throughout, it is taken quickly to the mouth, and with the mandible in centric relation to the maxillae, the patient is instructed to close gently against the soft recording material until the jaw has returned to the originally accepted degree of opening. At this time, a uniformly soft layer of recording material 3 mm. thick remains between the occluding surfaces of the opposing rims. (Fig. 5.)

Thus, a truly unstrained centric jaw relation record has been obtained, provided, of course, the heads of the condyles were in their most retruded rest positions in the glenoid fossae. An unstrained centric relation record really consists of two parts, the horizontal and the vertical. For the horizontal portion, the heads of the condyles are in their most retruded rest positions in the glenoid fossae, whereas, for the vertical portion, there is occlusal contact of the recording material against the teeth or rims of the opposite jaw.

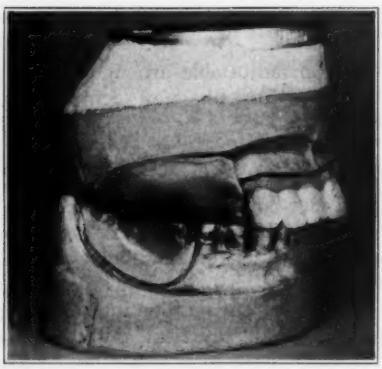

Fig. 5.—Mandibular cast. After the occlusal rims were constructed to establish the desired degree of opening, the occlusal surface of the upper rim was cut away to a depth of 3 or 4 mm. and this space was used for making the unstrained centric relation record in the mouth. This record is used for mounting the mandibular cast in the articulator.

In regular full denture construction, the horizontal portion of this record may be checked by means of the gothic arch tracing, but such a procedure is inconvenient when natural anterior teeth are present in the mouth. The vertical portion of the record may be checked after the recording material has been chilled and the excess trimmed away. With the base-plates firmly seated on the ridges, the patient is directed to open and gently close the jaws. The rims should make simultaneous contact throughout their occlusal surfaces. Points of premature contact indicate a faulty record and, in such case, the recording material, if made of wax, should be removed from the rim and the procedure repeated. If of modeling compound, the high spots may be heated and the record corrected. The occlusal rims and base-plates may be locked together either in or outside the mouth according to the accepted centric relation record. (Fig. 6.)

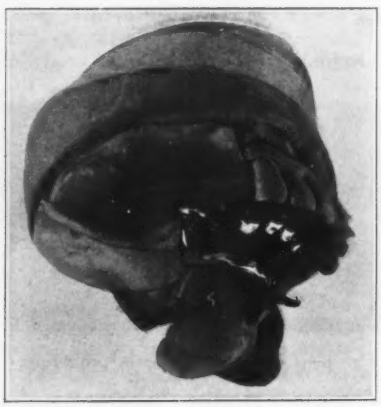

Fig. 6.—Lower occlusal rim seated on finished centric relation record. In a case requiring an immediate full denture for the lower jaw also, the gold work would be replaced by temporary base-plate material continuous with the saddle sections.

This assembly is now firmly seated on the maxillary cast previously mounted in the articulator by means of the face-bow record, and locked in position with sticky wax. The mandibular cast is then seated in the mandibular base-plate and locked in this position until mounted in the articulator with plaster of Paris. (Fig. 5.)

PROTRUSIVE RELATION RECORD

The protrusive relation record is made in the mouth and is used to adjust the condyle guides on the articulator in the following manner: The centric relation recording material is removed from the maxillary rim. A new roll of recording material is positioned on the rim so that it will oppose the opposite occlusal rim and teeth when the mandible is protruded about one-quarter inch. The roll is shaped as before and both rims are placed in the mouth. The patient is directed to protrude the lower jaw, usually an amount sufficient to bring the anterior teeth into incising contact.

With the lower jaw in this position, the patient is instructed to close gently against the recording material until the natural anterior teeth have come into very gentle contact. The impression is chilled thoroughly and removed, and after the incisal pin is raised, the rims are seated on their respective casts in the articulator. The lock nuts on the condyle guides of the articulator are loosened. The opposing casts and rims are placed in the same protruded relation to each other that existed in the mouth when this record was made. The condyle guides are raised and lowered until the rims and teeth come into the same stable contact established in the mouth. The condyle guides are locked and a record is made of the reading of each side. When the record is properly made, it should be possible to repeat it several times with very little if any deviation in the condyle readings. I prefer to repeat this record three times before accepting it as final. The incisal pin is returned and locked in its original position.

ADJUSTING THE INCISAL GUIDE

The occlusal rims are removed from their respective casts. The casts are placed in protrusive relation to each other with the incisal edges of the teeth, making edge to edge contact. The incisal guide lock is loosened and the guide tilted to make contact with the lower end of the incisal pin, and thus the anteroposterior incisal guidance presented by the natural teeth at the accepted degree of opening is recorded on the articulator. The casts are returned to centric relation and moved to left lateral jaw relation. The

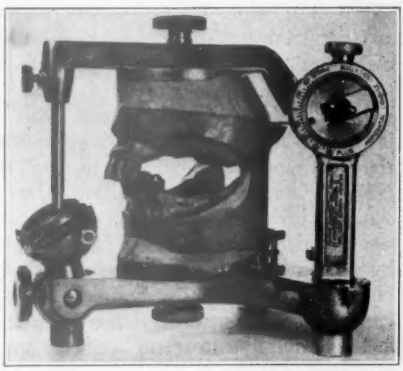

Fig. 7.—Steep anteroposterior and lateral incisal guidance resulting from deep vertical overbite present at accepted degree of opening.

lateral wing of the incisal guide is adjusted to make contact with the lower end of the incisal pin and moved to right lateral jaw relation, and the procedure is repeated. Adjustment of the incisal guide has been completed.[2] (Fig. 7.)

ANTERIOR TOOTH SELECTIONS

With Boley gage and dividers, the

2. JORDAN, L. G.: Selective Incisal Guidance in Full Denture Construction. J.A.D.A., 20: 976, June 1933.

exact measurement of the natural teeth as represented on the cast is obtained.

The practice of immediate full denture construction will reveal many facts to the operator regarding anterior tooth selection. He will find that natural anterior teeth are wider than the artificial teeth usually selected to replace them, also that artificial anterior teeth that present the proper length from collar to incisal edge and proper mesiodistal width in the incisal third are usually too narrow mesiodistally at the gingival third.

Careful use of the shade guide will also reveal a wide range of shades in a single row of natural anterior teeth. In other words, Nature seldom supplies the human mechanism with anterior teeth which are identical in color. Frequently, six natural anterior teeth are restored with six artificial anterior teeth all of different shades to imitate the natural effect.

In selecting artificial anterior teeth, it is well to keep in mind the long axis of the teeth which they are to replace. Natural anterior teeth often present slanting incisal edges, owing to unequal wear, and the reproduction of this effect by grinding results in an apparent shortening of the artificial tooth. For such cases, longer artificial teeth are indicated.

It is advisable to select artificial anterior teeth which are slightly oversize and imitate the natural teeth by careful grinding. Artificial teeth with long bites should be selected whenever possible, to avoid disturbing phonetics with the finished artificial denture. Some natural anterior teeth present rather flat labial surfaces; others are decidedly convex. These characteristics should be duplicated in the artificial teeth either by tooth selection or by grinding.

ANTERIOR TOOTH ARRANGEMENT

The question arises whether the artificial anterior teeth should imitate the natural teeth in both position and arrangement. There are two principal considerations which influence this decision, namely, the esthetic and the mechanical.

Esthetics.—In young patients especially, an irregular and unsightly arrangement presented by the natural teeth may be altered to advantage in the artificial substitute. Some patients, when smiling, expose a broad expanse of gum tissue above the necks of the natural teeth. If other factors permit, this condition should be improved by a different artificial tooth arrangement, accompanied by the necessary alveolectomy when the teeth are extracted. Such cases usually present a decided protrusion of the upper anterior

Fig. 8.—Case before extraction. Appearance may be improved by decreasing prominence of labial portion of maxillary ridge and raising level of anterior teeth.

teeth, frequently associated with a deep overbite. The case illustrated is of this type. (Fig. 8.) The improvement in esthetic values in this case resulted from a reduction of the labial process, in both the vertical and the horizontal plane. In other words, the artificial anterior teeth were positioned slightly higher and somewhat distally to the natural tooth positions. This reduced the prominence of the anterior region of the maxillary arch

and resulted in the equivalent of lengthening the lip. (Fig. 16.)

Mechanics.—The operator should aim to provide the best possible state of balanced occlusion in all immediate full denture construction. Excessive overbite and steep cusps should be avoided when possible. Condylar guidance must, of course, be accepted as recorded on the patient. If anatomic type posterior tooth forms are to be used, the overjet should be such that the posterior teeth will be in contact while the anterior teeth are in incising contact in protrusive jaw relation. (Fig. 10.)

In the case illustrated, several mechanical features are presented which, if imitated in the artificial denture, would prove detrimental from a mechanical standpoint. The natural anterior tooth arrangement results in a very steep anteroposterior and lateral incisal guidance. The overjet is too great to permit balanced occlusion in the artificial denture.

The combination of incisal guidance and condylar guidance presented by the patient would require overly high and steep cusps both laterally and anteroposteriorly on the posterior teeth. The proper interdigitation of the posterior teeth, together with the upper anterior tooth duplication, would result in an unsightly space between the upper cuspids and first bicuspids.

After analyzing the undesirable construction problems presented by the patient from both the esthetic and the mechanical viewpoint, it was decided to reduce both overjet and overbite. This of course resulted in a much flatter incisal guidance (Fig. 10) and an improved appearance and greatly simplified the mechanical problem of balanced occlusion.

It is not often that the operator encounters all of these problems in a single case. It is usually possible to imitate natural tooth position and arrangement without alveolectomy.

Fig. 9.—Cast trimmed to desired contour and teeth arranged according to the plan decided on; after shaping of artificial teeth. If natural tooth position and arrangement were to be imitated, only one artificial tooth would be positioned at a time and the ridge portion of the cast would be rounded off on the labial surface as indicated by the black line nearest the gum crest, this representing the approximate level of gum collapse after extraction.

Fig. 10.—Flatter incisal guidance resulting from decreasing vertical overbite. The decreased overjet permits protrusive balance while the anterior teeth are in incising contact. Occlusal contacts in eccentric jaw relations should occur on all posterior teeth, especially where partial dentures are involved.

SHAPING THE ANTERIOR TEETH

Before the anterior artificial teeth are arranged on the cast, they should be carefully shaped to imitate the natural teeth which they are to replace. The incisal edges should be given the proper inclina-

tion in reference to the long axes. Irregularities present on the natural teeth should be imitated in the artificial. Check lines or stained areas may be reproduced with porcelain stains, or by roughening the surface of the artificial tooth with a knife-edge stone. These roughened areas later become stained in the mouth.

In all cases of immediate or regular full denture construction, the necks of the artificial teeth should be reshaped to increase retention in the plastic material and to enhance esthetic values by accentuating the line of demarcation between the labial or buccal surface and the collar. There should be a greater difference in level of these surfaces. The collar should be ground down with a disk or knife-edge stone to provide a more definite shoulder. This will permit a more pleasing appearance and allow greater bulk of plastic material over the collar in the finished denture. This grinding should be carried around onto the proximal surface, where it is made deeper or more angular to improve tooth retention. After proper preparation, the teeth are ready for arrangement on the cast.

ARRANGING THE ANTERIOR TEETH

Where the artificial tooth arrangement is to imitate the natural, the following procedure should be used. One tooth is removed from the cast with a mechanical saw without disturbing the area represented by the root of that tooth. All surfaces should be left smooth and convex. As a slight collapse of the labial gum tissue along the gingival line may be expected after tooth extraction, this area may be scraped slightly in all cases.

The duplicate cast previously made will serve as a guide in imitating natural tooth position and alinement. It is advisable to stagger the removal of teeth from the cast, such as right central incisor, left lateral incisor, right cuspid and right lateral incisor. Each tooth should be replaced by its artificial substitute, however, before others are removed from the cast. In the case illustrated, three anterior teeth on one side were removed and the ridge carved to the form desired.

The artificial teeth were then arranged directly on the surface of the cast. The same procedure was followed on the opposite side. Both overjet and overbite having been reduced, it is possible to readjust the incisal guide, which it will be noted is now much flatter. (Fig. 10.)

POSTERIOR TOOTH SELECTION AND ARRANGEMENT

Selection of posterior tooth form is too lengthy a subject to be dealt with in this paper. In the case illustrated, the anatomic type tooth form was used to facilitate balancing the occlusion of the finished prosthesis. The posterior teeth are arranged directly on the surface of the cast (Fig. 11) in accordance with the fundamental principles relative to denture stability and balanced occlusion that apply to regular full denture construction. Ridge relations often make it inad-

Fig. 11.—Artificial teeth attached firmly to surface of cast. This is accomplished during tooth arrangement. Waxing of labial, buccal and palatal areas is done after the teeth have all been arranged. The extra cuspids in this case were necessitated by the deep overjet still remaining. Their presence also permitted proper occlusion of the upper bicuspids with their antagonists.

visable to duplicate the natural posterior tooth arrangement.

WAXING, CARVING AND FLASKING

The buccal, labial and palatal surfaces of the cast are waxed to proper thickness and contour. The palatal area is waxed as thin as possible to avoid interference with the natural speech habits of the patient.

The cast is removed from the mounting on the articulator and invested in the flask. If a transparent base is to be constructed, the operator should use two identical flasks. The upper half of each flask should fit the base of the other. The

Fig. 12.—Trimmed cast and hydrocolloid impression. After the case has been flasked and opened, the trimmed portion of the cast is made smooth. The ring portion of another flask is used to secure a hydrocolloidal impression, which, in turn, is used to make a duplicate cast.

flask is opened in the usual manner and the mold and cast are thoroughly cleaned. The anterior region of the cast is now exposed for the first time since the removal of the teeth from it, and probably presents rough areas which should be rounded off before proceeding further.

DUPLICATING THE EXPOSED CAST FOR TRANSPARENT BASE CONSTRUCTION

The ring portion of the extra flask is placed on the base containing the cast. A proper mixture of hydrocolloidal material is poured into the ring to secure an impression of the cast as it now appears. After thorough chilling, the upper half of the flask is carefully removed to avoid injury to the impression within it. (Fig. 12.) This impression is filled with artificial stone and built up to provide a cast of proper strength. This cast is used in making the transparent base-plate which will serve as a guide in performing the necessary alveolectomy.

DENTURE MATERIALS

The problem of selecting a base material for immediate full dentures is not

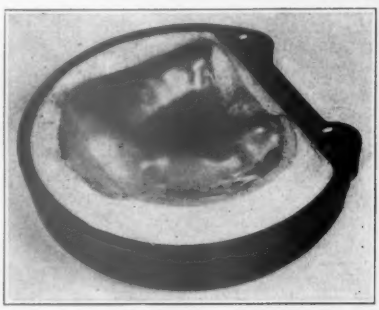

Fig. 13.—Wax base-plate of 28 gage formed on duplicate cast, which in turn is invested in another flask. When it is opened and the wax removed, this mold may be used for pressing sheet celluloid.

very different from that present in regular full dentures, except that the need for rebasing, especially in the anterior region, may occur sooner. Metal bases are of course impractical for any first full dentures. The operator should aim to provide the patient with the best possible finished denture and a discussion regarding materials to be used should be avoided when possible.

In packing, curing and finishing the denture, the operator must be guided by the technics which apply to the material of his choice. The inner surface of the

finished denture should be made very smooth and should present a rounded concave form. If depressions were carved in the stone cast when the teeth were removed, elevations will appear on the inner surface of the denture. They should be removed to permit the ridge to assume a smooth well-rounded form.

THE TRANSPARENT BASE

If extensive alveolectomy is to be performed, a transparent base will prove an excellent aid in shaping the ridge to conform to the cast on which the denture was made. Such bases may be made from sheet celluloid or from a transparent thermocure material. The procedure for making a celluloid base follows.

Fig. 14.—Thermocure transparent base. Base-plate wax of regular thickness is used. After investment in base of flask, it is covered as shown with 0.003 inch tin-foil. After opening of the flask and removal of the wax, the cast is covered with tinfoil (0.001), a metal lined mold for curing the material resulting.

A sheet of base-plate wax of 28 gage is adapted to the cast made from the hydrocolloidal impression, to form a base-plate, the tissue surface of which will be identical with the base of the finished denture. This cast is then properly invested in a vulcanite flask, the flask opened and the wax removed. A sheet of transparent celluloid forty-thousandths inch thick and of proper dimensions is placed over the cast between the two halves of the flask. This assembly is placed in the flask press and immersed in boiling water, where it remains for several minutes while the operator continues to tighten the press until the flask is closed. The entire assembly is then placed in cold water and allowed to remain until thoroughly chilled, when the flask may be opened, the celluloid base and cast removed and the base carefully trimmed and reseated on the cast, where it is held with rubber bands and kept in a moist place until used.

I prefer to construct the transparent base of a thermocure material, using the following procedure. A sheet of ordinary base-plate wax is adapted to the cast and the cast invested in the pan portion of the vulcanite flask. (Fig. 13.) Tin-foil about

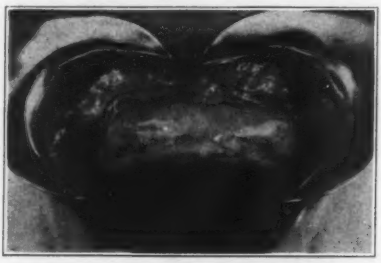

Fig. 15.—Transparent base in position on ridge to serve as guide in trimming alveolar process. After the surgical procedures have been completed, the gums are molded to position and the sterile denture is seated on the ridge. (The author has not found sutures necessary.)

0.003 inch thick is adapted to the surface of the wax and over the investing material nearly to the inner edge of the flask. (Fig. 14.) The upper half of the flask is filled and, after the plaster has hardened, the flask is opened and all traces of wax are removed in the usual manner. The cast and adjacent areas are now covered with 0.001 inch tin-foil. The completely metal-lined mold is now ready to be filled with the transparent base material and cured according to directions accompany-

ing the material used. Transparent bases of this type are more rigid than those made of sheet celluloid and are less liable to warp.

PREPARATION OF THE MOUTH AND INSERTION OF THE FINISHED DENTURES

The teeth are extracted and any necessary alveolectomy is performed. When the ridge has been shaped approximately as desired, the transparent base is seated, and high points or areas in the field of operation are easily detected by blanching of the mucosa or by lack of stability of the base. (Fig. 15.) When a general anesthetic is used, there is no distension of the soft tissues in the areas of extraction and alveolectomy to prevent proper seating of the transparent base and blanching of the tissues where high spots remain. The field of operation should be thoroughly cleaned of small bone particles and the soft tissues folded over the newly prepared ridge to form a well-rounded surface. If the labial gum flap overlaps the lingual gum tissue, it should be reduced in length. Suturing is not necessary because the denture base maintains the tissues in proper position.

Fig. 16.—End-result in case shown in Figure 8; level of anterior teeth raised to improve appearance. Alveolectomy should be avoided whenever possible.

The finished denture, which has previously been immersed in an antiseptic solution, is seated in the mouth, where it should remain for a few hours before removal; after which, the patient should remove the denture hourly and wash the mouth very gently.

The operator should observe the case daily until it appears that corrections are no longer necessary. As in all denture construction, the occlusion should be checked carefully and the patient be again advised of the changes that will occur as a result of tissue resorption.

SERVICING FULL DENTURES

Regardless of the care exercised in full denture construction and the apparent perfection at the time of insertion, it must be expected that changes will occur in full or partial denture foundations which are disturbing to occlusion, comfort and efficiency.

Until the time arrives when tissue changes under artificial denture bases can be prevented or controlled, such dentures must be considered as temporary, whether placed in the mouth immediately after tooth extraction or several months later. This fact has not been properly impressed on the public and, as a result, there have been many misunderstandings between patient and dentist.

Practically everything which we use in our daily life requires some form of servicing or upkeep, and the public willingly accepts this obligation when the purchase is made, because the reason for it is understood. As a result, the service branch of many types of business plays a very important part in prolonging the life and reputation of their products.

Dentists should cease speaking of permanent artificial dentures and inform the patient of what is to be expected when dentures are worn. The value of timely rebasing and occlusal correction should

be demonstrated and the patient should be impressed with the fact that new dentures should be constructed at proper intervals. The only reason many patients are not following such habits is that they have not been informed as to their importance.

The initial tissue changes to be expected under immediate full denture bases will occur in the anterior region where the teeth were last extracted. This area may require rebasing before such need is evident in the posterior part of the mouth. I have found the eugenol paste impression materials excellent for securing rebase impressions whether of a local area or of the entire denture seating surface. If rebasing is required only in the anterior region, this impression may be left in the denture and renewed when necessary until such time as the entire denture may need rebasing, when a complete impression is made and the denture rebased or duplicated in the conventional manner. If this material is used in translucent denture bases, it should be pink.

Operators who use the celluloid type of denture material may use a paste, made by dissolving some of the same material in acetone, to secure the local rebase impression. A thin sheet of cellophane is placed over the paste before the denture is seated in the mouth to prevent the acetone from burning the tissues. This material soon hardens and becomes a fixed part of the original denture. I first learned of this technic from W. J. Pryor several years ago.

The recuring of denture materials should be avoided whenever possible. Some materials lose their original color; others are liable to shrink or warp. Rebasing technics should not be used to increase the degree of opening in full dentures. The denture should be carried all the way to place in rebase impressions, any necessary change in degree of opening should be accomplished by making a new unstrained intermaxillary record between the occlusal surfaces, which establishes the new degree of opening, and this relation should be transferred to the articulator, where the artificial teeth are rearranged and new denture bases made.

CONCLUSIONS

It is generally admitted that the most difficult patient to please is the one who is learning to wear his first artificial dentures, but it is a fact that immediate full denture service comes close to totally eliminating the distress which usually accompanies the wearing of first dentures. Immediate full denture patients seem to accustom themselves more readily to the new experience, and the appearance is much less altered than is the case where delayed full denture service is practiced.

The mechanical problems are simplified because the masticatory and facial muscles are not given an opportunity to change form and the patient does not develop those unfavorable speech and chewing habits which accompany a long edentulous period.

Some patients delay the extraction of infected teeth because of the fear and dread of the edentulous period.

The patient's natural anterior teeth serve as an excellent guide in shaping and arranging the artificial substitutes.

The technical procedures of immediate full denture construction differ only slightly from regular full denture procedures, and any extra work which may be involved in the initial construction is more than compensated for by the pleasing results and the slight attention required from the dentist during the early wearing period.

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PURPOSE AND PROCEDURE IN REINFORCING AMALGAM

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ENDLESS experiments and research have been carried on by dentists, manufacturers and the Bureau of Standards to improve silver amalgam restorations. Likewise, the Bureau of Standards has set up new standards or requirements with which all amalgam manufacturers must comply if their product is to be certified, the most important of these requirements being specified silver content, expansion and flow. Whereas the crushing test was formerly the determiner of the strength of amalgam, this has been superseded by the flow test.

When we consider that the cavity dimensions of an amalgam restoration are practically the same as for a cast gold inlay, we may wonder why an entirely different system of determining the strengths of the two materials is used. The reason is quite apparent: Amalgam is simply too weak to stand the tests that are commonly used for gold or silver. For example, no reports are given out as to the tensile strength of amalgam, although this is always shown when gold is tested. The reason for this is that amalgam has a very low tensile strength, which would compare most unfavorably with the high tensile strength of gold or silver. Lacking in tensile strength, amalgam is naturally very low in transverse or bending strength, which is a combination of both crushing and tensile strength. Still the two materials, that is, amalgam and gold, are used in practically the same shape and size cavities, and of necessity are expected to withstand equal forces in the mouth.

Another factor which has been more or less ignored in the past and to which we must give serious attention in our amalgam work is the progressive action of heat on amalgam. This phenomenon is little understood or appreciated. I believe that Mr. Chott, of Chicago, presented the first concrete work on the behavior of amalgam at temperatures above room temperature. According to his report, which was forwarded to the Bureau of Standards, amalgam that would flow less than 4 per cent at room temperature would flow as much as 25 per cent at 98°, or mouth temperature. My experiments have shown that some amalgams flow as much as 30 per cent at mouth temperature. This simply means that the physical properties of amalgam are greatly changed by body temperatures and the presence of hot foods and drink, the reason for this being the great amount of mercury that is present in the amalgam restoration. More than 50 per cent of our present-day amalgam restorations are of mercury, as shown in the work of Dr. Ward, of Michigan. This same mercury content of the amalgam causes the progressive distortion that so frequently takes place in large amalgam restorations, the result being that gradually some part of the amalgam is pulled away from the cavity wall in a progressive, spheroiding action of the mass. When this takes place,

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the edges of the amalgam are left unsupported, and as amalgam has poor edge strength, the forces of mastication soon chip the unsupported margins and permit recurrence of decay.

When a material such as gold is used, the small temperature range between room temperature and mouth temperature has, as we know, no effect on the restoration, and we have been led to assume that the same holds true of amalgam. Unfortunately, this is not the case. Although it is true that poor technic in mixing amalgam, or in condensation of the amalgam in the cavity or mold, will aggravate the above-mentioned faults, they are still present when amalgam is mixed and manipulated under ideal conditions with the most exacting technic. The old story that amalgam failures are always caused by either faulty cavity preparation or poor technic in manipulating the amalgam is an injustice to the average practitioner.

In practice, we are frequently confronted with one of two procedures, a cast gold or an amalgam restoration. True, we attempt to vary cavity preparations so that a little more bulk is obtained in the dovetail of an amalgam restoration, trying to overcome the weakness of the amalgam by increasing the size of the mass in that area. Unfortunately, teeth are not large enough, nor does their structure permit of increasing the area of the dovetail very much. As a result, most amalgam restorations will stand only from one-seventh to one-tenth the occlusal force or pressure that the cast gold inlays will stand. In reality, the neck of the dovetail of the amalgam of the average restoration can be broken by finger pressure. We know that a cast gold inlay cannot be fractured at the neck of the dovetail with finger pressure.

Most of us believe that silver amalgam is a great deal stronger than dental cement, but such is not the case. With a small rectangular mold, bars of both silver amalgam and cement were prepared. When they were tested on a machine for transverse or bending strength, the results were as follows: amalgam, 3 pounds; dental cement, 2½ pounds. Cast gold in the same dimensions gave way at 21 pounds. This gives us a practical picture of the comparative strength of these three materials, and what pressures we can reasonably expect them to withstand in the mouth.

Further experiments showed that by doubling the size of the amalgam bar, the testing results were raised from 3 pounds to 5 pounds; in other words, increasing the dimensions of the amalgam does not bring about the increased strength we should naturally expect. Although it is true that we attempt to reduce the strain on the occlusal dovetail of amalgam restorations by grooving the buccal and lingual walls, this procedure can be followed with any great success only when decay has not progressed to any great extent buccolingually.

A report on the possibilities of reinforcing amalgam by the use of silver bars or plates was first presented at the 1935 A.D.A. meeting.[1] This report showed that, by proper reinforcing, the transverse strength of amalgam can be increased several times, and that it is just as practical to reinforce dental amalgam as it is to reinforce concrete. With identical molds, the following transverse test strengths were attained: dental strength, 2½ pounds; silver amalgam, 3 pounds; reinforced silver amalgam, 18 pounds; cast gold, 21 pounds. In other words, the strength of amalgam can be brought up to almost that of cast gold. This report also showed that the flow of reinforced amalgam is about one-half that of ordinary amalgam.

Naturally, there is a great deal of difference in reinforcing amalgam in a mold in the laboratory and reinforcing an amalgam restoration in the mouth. Cavities in the mouth are of varied shapes

and sizes. However, once the general principles of reinforcing are understood, the procedure is quite simple. The strength that any reinforcing material will give depends on the strength and form of the reinforcement and the bond that is formed between it and the material to be reinforced. When amalgam is reinforced by the use of silver plates, a chemical union takes place between the two which is a great deal stronger than the bond formed between steel and concrete. The thickness of the silver plate used depends on the depth of the cavity, and its shape or form follows the outline form of the cavity.

I use sterling silver in preference to pure silver as it is more rigid and withstands tapping in the amalgam without bending out of shape. The sterling silver, which can be obtained from any manufacturing jeweler, is rolled out in three thicknesses: 20/1000; 25/1000; and 32/1000, which correspond to 24, 22 and 20 gage. The 22 gage, or 25/1000, will take care of most cavities. Naturally, the thinner material is used in shallow cavities and the thicker material in deep cavities. After the sterling silver is rolled out to the desired thickness, it is cut in strips from 1 to 7 mm. wide. This is done to conserve time in shaping the reinforcing plate. If the cavity is narrow, a narrow strip is used, wider strips being used for the more extensive cavities. These strips of the sterling silver resemble strips of gold solder that are on the market, varying only as to the width and thickness.

An outline of the complete procedure in reinforcing a single surface amalgam restoration is as follows: The cavity is prepared with the usual standard procedure for an amalgam filling. When this is complete, a strip of the silver reinforcing material considerably smaller than the cavity is selected and, from the end of this strip, a plate is fashioned, roughly the same shape as, but smaller than, the cavity outlined. Mounted stones or carborundum disks are used for this work. The silver plate is placed in the cavity, the operator making sure that the plate is a very loose fit. In other words, we have roughed out a very loose fitting silver inlay—one which is considerably smaller in all dimensions than the cavity. I might say here that operators starting to use this technic invariably make the mistake of having the plates fit the cavity too closely. Not only is this a waste of time, but it likewise complicates placing the plate, as will be shown later.

With the loosely fitting reinforcing plate on the operator's tray, silver amalgam is prepared in the usual manner. When it is properly mixed, the cavity is packed with the amalgam until the cavity is from one-half to two-thirds filled, the operator using whatever technic he prefers. The silver reinforcing plate is then placed on the amalgam and, with a gold foil mallet and a blunt instrument, is gently tapped until the silver plate is occupying approximately the center of the cavity, compressing the amalgam and forcing it between the sides of the plate and the cavity wall. The amalgam is immediately packed over the plate and the filling completed as if it were an ordinary amalgam filling. Just as steel is embedded in concrete to reinforce it, the silver plate is embedded in the amalgam. Occasionally, in carving the filling, parts of the silver reinforcing plate may be exposed on the occlusal surface, or it may be necessary to cut away some of the silver reinforcing plate with a bur or stone to permit the proper occlusion. This will in no way harm the restoration outside of the fact that silver plate will discolor a little more when exposed in the mouth than the amalgam will.

Although the general principles of reinforcing amalgam apply to all cavities, the procedure must be varied somewhat in dealing with compound activities. The base of a single surface cavity is flat,

whereas, in the compound cavity, it is a step arrangement. In reinforcing a compound cavity, the part of the cavity between the pulpal wall and the gingival seat is treated as one unit and the remainder of the cavity as another. A reinforcing plate or plates, the choice depending on the depth of the proximal portion of the cavity, of the same general shape, but smaller than the gingival seat, are roughed out from the end of a silver reinforcing strip. This can generally be made simply by cutting the strip with a pair of shears. If this portion of the cavity is very deep, two plates can be cut for it.

Now a plate is roughed out having the same general outline, but smaller than the occlusal outline of the cavity. With these plates placed conveniently on the operating tray, we are now ready to adjust the matrix and mix the amalgam. A layer of amalgam is packed in the usual manner over the gingival seat. When about 2 mm. of amalgam has been packed over the gingival seat, the reinforcing plate prepared for this area is placed on the amalgam and gently tapped against the gingival seat. The amalgam is immediately packed over the plate, building up the proximal portion of the cavity. If there is room for another plate in this portion of the cavity, it is then placed on the amalgam and tapped into position. However, care must be taken that this plate does not extend above the pulpal wall, as it might interfere with the placing of the occlusal plate. Amalgam is now packed until about two-thirds of the occlusal portion of the cavity is filled. Then the occlusal plate is placed on the amalgam and tapped into position as in a single surface cavity. Amalgam is immediately packed over it and the filling completed, the carving and polishing to be done in the usual manner.

When compound cavities extend very far in a buccal or lingual direction, v-shaped pieces of the reinforcing material are cut out and tapped into the freshly packed amalgam tight against the wall at the cavosurface angle, just deep enough that it will be covered by a layer of amalgam. This is to prevent shearing off of the amalgam in the region of the cavosurface angle, and likewise to prevent the distortion of the amalgam at this point due to the action of heat on the mass. It will be noted that plates are placed in the gingival portion of the cavity not to increase the strength of the filling, but to prevent distortion of the amalgam in that area. However, the occlusal reinforcing plate is used primarily to increase the strength of the filling, particularly at the neck of the dovetail, or in the case of mesioclusodistal fillings, at the connecting neck between the proximal portions of the filling. It likewise serves to prevent the distortion of the amalgam in the occlusal portion of the cavity. The factor of distortion of amalgam in the mouth is considered by many amalgam experts to be a more serious fault than the low strength of the amalgam.

On using this method of reinforcing amalgam, the first reaction is that much time is consumed by the operator in shaping the reinforcing plate or plates. With the silver reinforcing material cut in varied width strips, and with a clear-cut understanding of the fact that the reinforcing plates must not be made to fit closely, the entire procedure of shaping the plate or plates should consume only a few minutes. I have found that an assistant can readily shape these plates, and several sizes and shapes can be kept ready for use at the chair. In this way, the reinforcing principles can be carried out with a minimum expenditure of time.

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HEMORRHAGE OF THE MOUTH: CAUSES AND TREATMENT

By Casper M. Epstein, M.D., Chicago, Ill.

HEMORRHAGE in the mouth may have various causes. It may be a simple oozing or it may be very profuse; it may be very easily controlled or it may be very resistant to treatment and controlled only after a great deal of effort. The amount of bleeding depends not only on the cause, but also on the severity of the cause; not only on the local condition, but also on the systemic condition.

Severe bleeding can sometimes be controlled, or its degree minimized, if certain factors are known preoperatively, such as whether there is a history of hypertension, hemophilia, a hemorrhagic diathesis or any blood dyscrasia, or any deviation from normal of the bleeding or of the coagulating time; whether there are any systemic disturbances, such as hyperthyroidism, cardiac disease, diabetes and nephritis, or whether the patient has recently convalesced from an acute infectious disease, severe or otherwise, or from a chronic debilitating condition.

The depth of a wound is of greater importance than its exact location. Whereas mere oozing from superficial wounds may be controlled by pressure, a violent gush of blood, whether arterial or venous, from a deep wound requires ligation to control it.

Among the most common causes of hemorrhage in the mouth, prolonged postoperative bleeding following extractions gives the patient great concern. If it is assumed that the only cause of the trouble is localized in the area of operation, it is evident that there has been an unnecessary degree of trauma to the tissues involved. The blood covered area is irrigated and dried as much as possible, with sterile gauze. If the soft tissues have been mercilessly lacerated, as they very often are, débridement is indicated, followed by the insertion of one or more catgut sutures. If the bleeding comes from the depths of the socket, a piece of modeling compound is warmed and pressed gently but firmly into the vacated space. The modeling compound is chilled with cold water and a catgut ligature tied over it as tightly as possible. The ligature is allowed to remain for from twenty-four to forty-eight hours, and is then removed and the wound is irrigated. The ligature is replaced with a gauze packing saturated with the antiseptic which the operator prefers. This is continued until healthy granulation tissue fills the wound.

Pyorrhea alveolaris is common and often bleeding is the first symptom which becomes annoying enough to cause the patient to seek relief. The gingival margins recede by erosion and the gums become spongy and very often swollen. The extent and severity of this pathologic condition determines the amount of pressure and trauma necessary to produce

bleeding. The methods of treating pyorrhea are so varied and numerous that they will not be considered at this time.

Large dental cavities are obvious, but smaller ones on the proximal surface may not be detected, and if they are close enough to the gingivae to cause irritation, bleeding may result even on brushing the teeth.

Salivary calculus is usually obvious on inspection and may be present in large enough deposits to irritate the gingivae to develop swollen, spongy masses.

In ulcerative gingivitis, more commonly known as trench mouth or Vincent's infection, the bleeding very often produces nausea. The gums are swollen and tender and bleed on the slightest provocation. The drugs used in treatment include the silver nitrate-iodine combinations, oxygen-producing drugs, aniline dyes and neoarsphenamine.

Fractures of the jaw, lower or upper or both, are almost invariably associated with hemorrhage. The amount of bleeding depends on the extent of the involvment and the severity of the injury. If the upper jaw is involved alone, very often the hemorrhage is into the antrum, with or without resultant epistaxis, and the soft tissues are lacerated and bruised. The part is allowed to rest and the mouth irrigated with warm saline or any antiseptic solution. Ice bags are applied, and ice pellets ordered for the mouth. As soon as the immediate shock of the injury has subsided, the fracture is reduced and immobilized in the manner best suited to the location and extent and in accordance with the experience of the operator.

It is not uncommon for injuries to occur during dental operations. The slipping of a bur or a disk may produce a wound in the gingivae, which can be controlled by pressure and cold sponges. On the other hand, if the floor of the mouth is injured, or the buccal mucosa lacerated to the extent of a deep wound, sutures may be required to control the bleeding and approximate the edges of the wound.

Angiomatous epulides are very vascular and bleed very readily. They are best removed by electrocoagulation, actual cautery, or if the lesion is not too large, endothermy. If the scalpel is used, the edges of the wound should be cauterized.

In gingivitis gravidarum, not uncommonly, the gingivae become inflamed and spongy and bleed on the slightest provocation. The condition may vary from a slight puffiness to the stage where the teeth are all but hidden from view by the edema. Such cases are difficult to treat and, in the light of our present knowledge, are best handled on an empiric basis, with astringent mouthwashes, oral hygiene, nutritious diet (avoiding all irritating foods, such as very hot, spicy, sour and salty foods and condiments) and such measures as may be necessary to build up the general tonicity. Usually the symptoms disappear shortly after delivery, if not almost immediately.

Degenerating leukoplakia is usually malignant. In all malignancy of the mouth, the bleeding, as a rule, is not due to the tumor itself, but rather to the erosion of blood vessels by the tumor mass. The bleeding, therefore, would depend on the size of the vessels eroded. I have seen spurts of blood in involvement of the lingual artery, palatine artery, tonsillar vessels, external maxillary artery, etc.

I recall a case of cavernous lymphohemangioma of the left mandible in a young girl, 18 years of age, and four months pregnant. The mass extended from the angle of the jaw to the mesial border of the first bicuspid, presenting a centrifugal ray-like appearance on the roentgenogram. The soft tissue mass involved only the area of the last two molars, growing up and around them. The teeth involved were loose. When tissue was removed for biopsy, sufficient hemorrhage resulted to warrant ligation of the external carotid artery. At times,

the bleeding started very suddenly without apparent provocation and was profuse. The treatment consisted in repeated electrocoagulation and two blood transfusions. A total of five electrodesiccations were necessary before the tumor mass was completely destroyed. Incidentally, the patient gave birth to a normal child at full term.

Malignant tumors, whether carcinomatous or sarcomatous, cause hemorrhage by invasion of blood vessels rather than because of their inherent neoplastic nature. The treatment of malignancy of the mouth is far too large a subject to discuss here, but it may be said that hemorrhage caused by the tumor is best treated by ligation of the bleeding vessel, if this is at all possible. Should this be deemed impractical, the electric spark, which has proved of value, together with electrodesiccation of the tumor mass, can be used.

Some of the less common diseases which cause oral bleeding are included herewith for the sake of completeness: scurvy, acute lymphatic leukemia, Hodgkin's disease (malignant lymphoma), agranulocytosis, pernicious anemia, aplastic anemia, hemophilia, polycythemia vera, purpura hemorrhagica and mercurial, bismuth and iodine poisoning. Hemorrhage the result of blood dyscrasias may be controlled by blood transfusions. In cases of poisoning, mentioned above, the drug is removed, warm alkaline mouthwashes are prescribed, and compound tincture of benzoin is applied to the bleeding areas with some pressure. This may be followed by instructing the patient to keep ice pellets in the mouth for from thirty to forty minutes. A saline cathartic, such as magnesium citrate, is also advisable.

SUMMARY

Hemorrhage in the mouth may be of local or systemic origin. Several broad measures may be adopted for its control. When it is of local origin other than traumatic, pressure and soothing alkaline mouthwashes are advisable, followed by the application of compound tincture of benzoin or a paste of tannic acid and epinephrine.

If the hemorrhage is traumatic in origin, one or more ligatures may be necessary. If the bleeding is on a systemic basis, it is treated as a local condition and, if necessary, the use of hemostatic sera or blood transfusion may be indicated. The electric cautery, endothermy and diathermy spark gap are therapeutic adjuncts most welcome at times to both patient and surgeon.

Whether the condition is of local or systemic origin, all acid, spicy, sour, very hot and very salty foods should be avoided. Condiments are also best omitted.

In all cases in which a considerable amount of blood has been lost, the patient should be urged to drink large quantities of liquids.

Both parathyroid and ovarian extracts have been injected by some as a prophylactic or to prevent recurrent bleeding, the rationale being to increase the calcium content of the blood with its attendant coagulating powers. Similarly, calcium may be prescribed.

25 East Washington Street.

A STUDY OF ORTHODONTIC AND FACIAL CHANGES, AND EFFECTS ON DENTITION ATTENDING THE LOSS OF FIRST MOLARS IN FIVE HUNDRED ADOLESCENTS

By J. A. SALZMANN, D.D.S., New York, N. Y.

THE practice of extracting first molar teeth in children as an orthodontic measure and with the expectancy that the second molars would invariably drift forward to occupy the spaces formerly held by the first molars has been shown to be based on a false premise.[1] Furthermore, not only do the desired results fail to be realized in the great majority of cases, but also the practice is fraught with many dangers which may jeopardize the dentition as a whole, increase the incidence of caries and leave their mark forever on the health and facial appearance of the growing child. The last-mentioned effect may initiate a complex of unfavorable sequelae ranging from general bodily disturbances to mental aberrations, including speech defects, and leading, among other things, to difficulty in obtaining employment and general maladjustment to environment. Thus, the loss of even a single first molar tooth in a young child brings about changes which may affect his whole life.

And yet thousands of these teeth are extracted daily and the child patient leaves the dental office unaware of the dangers that lie in store for him as the result of these operations. The reason for this practice is quite clear. The parents do not know and the dentist does not explain how important—many not considering it so—it is to replace extracted permanent teeth in children.

Full upper and lower dental impressions were taken and casts made of 500 cases in boys and girls, 15 to 19 years of age, who were found to have had from one to four first molar teeth extracted. An additional group of boys and girls in the same age range who had not lost any of the first molars was also studied for purposes of control and comparison. Altogether, 1,000 cases were studied, embracing the various ethnic, economic, social and intellectual components to be found in the school population of Greater New York.

FREQUENCY AND DISTRIBUTION IN JAW QUADRANTS OF FIRST MOLAR EXTRACTIONS

Table 1 shows the number and percentage of children in a group of 500, from 15 to 19 years of age, who had one, two, three or four first molars extracted per child; the actual number of first molars lost in each age group; the average number of first molars lost per child in each age group; the total number of first molars lost, and the average number of first molars lost per child in the group of 500 children studied.

There was a total of 945 first molars

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extracted in 500 children. The number of molars lost per child at 15 years was 1.77, and there was an increase to 2.02 at 19 years. There was an average of 1.88 molars lost per child in the group of 500 children studied.

Figure 1 shows the distribution of the extracted first molars in the four jaw quadrants of the 500 children. For the purpose of this study, 941 first molars were considered. One from each quadrant was omitted. Of the total number of first molars extracted, 14 per cent were in the upper right; 16 per cent in the upper left; 33 per cent in the lower right, and 37 per cent in the lower left quadrant of the jaws. The significance of these figures should give us a great deal of food for thought.

Table 1.—Number and Percentage of Molars Extracted in 500 Children

Molars Lost	One Molar		Two Molars		Three Molars		Four Molars		Total No. Children	Molars Lost	No. Molars per Child
Ages	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent			
15	31	15.5	29	15.8	7	8.1	4	13.8	71	126	1.77
16	84	42.0	77	41.8	30	34.5	9	31.0	200	364	1.82
17	53	26.5	53	28.8	31	35.6	10	34.4	147	292	1.98
18	23	11.5	18	9.8	14	16.1	3	10.4	58	113	1.95
19	9	4.5	7	3.8	5	5.7	3	10.4	24	50	2.02
Total	200	100.0	184	100.0	87	100.0	29	100.0	500	945	1.88

Table 2.—Effect of Extraction of First Molar

First Premolar	Second Premolar	Second Molar	Symbol Designation of Position
No movement	No movement	No movement	= O-O-O
No movement	Moved	No movement	= O-D-O
Moved	Moved	No movement	= D-D-O
No movement	No movement	Moved	= O-O-M
No movement	Moved	Moved	= O-D-M
Moved	Moved	Moved	= D-D-M

DIRECTION OF MOVEMENT OF FIRST AND SECOND PREMOLARS AND SECOND MOLAR AFTER EXTRACTION OF FIRST MOLAR

The first and second premolars and second molars in the jaw quadrants from which the first molars had been extracted showed change of position consisting of movement usually attended by rotation and inclination of the respective teeth mentioned. In the attempt to study the frequency of occurrence and the amount of distal movement of the first and second premolars and the mesial movement of the second molars in the respective jaw quadrants from which the first molars had been extracted, the symbols in Table 2 were employed.

Table 3 shows the location, number and percentage of the jaw quadrants in

each of the above-mentioned six designated positions, and the total number of quadrants in each of the six designated positions, as well as the total number and percentage of jaw quadrants in each of the four jaw divisions (i.e., upper right, upper left, lower right and lower left). The analysis presented in Table 3, it should be kept in mind, shows the distribution of the positions of the first and second premolars and second molars in the respective jaw quadrants at the time

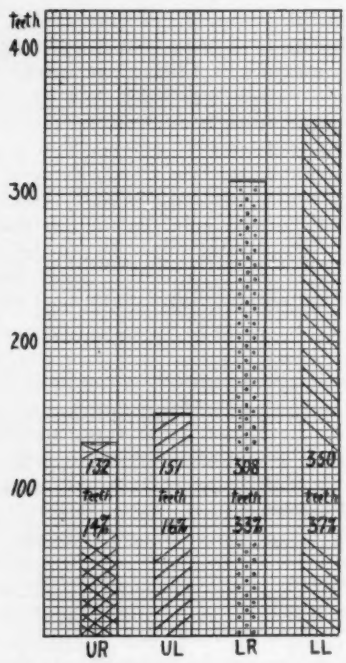

Fig. 1.—Number of first molars lost, by jaw quadrants.

of examination only, without regard to the interval of time that may have elapsed between the extraction of the first molars and the examinations made for this study. It can be seen from Table 3 that in this group of 500 children with 941 first molars extracted, 67.6 per cent of the quadrants showed movement of both the first and second premolars distally and the second molars mesially. Only 13.6 per cent of the quadrants showed forward movement of the second molar. The latter movement is the type expected by those who extract first molars under the impression that the second molars will invariably drift forward to occupy the vacated space. All types of movement except D-D-M tend to disappear at various increasing intervals after the extraction of the first molar, until the D-D-M position alone prevails, as we shall show here.

Figure 2 is a percentage frequency graph of the distribution in the six designated positions of the first premolar, the second premolar and the second molar in the 941 quadrants and is based on the figures presented in Table 3. There appears to be close correlation between right and left and upper and lower jaw quadrants. There are more quadrants in the O-O-M position in the upper jaw, whereas the D-D-O position shows more quadrants in the lower jaw. All quadrants show a high degree of correlation in the D-D-M position.

The 941 extracted first molars in the 500 children were, of course, lost at various intervals previous to the examinations made for the purpose of the present study. These intervals ranged from three months to twelve years, the first molars having been extracted when the children were between 7 and 19 years old, the latter being the age limit of the children included in the study. There was a fairly even distribution of children with first molars extracted at intervals of from one to eight years prior to this examination. Table 4 shows the distribution in the six designated positions of the first and second premolars and second molar in each of the jaw quadrants from which the first molar had been extracted, correlated to the interval of time elapsing since the first molar was extracted and when the examination of the child was made.

Table 4 shows a definite tendency for all of the premolars to move distally, as well as for the second molars to move mesially (D-D-M) as the interval between extraction and examination increased.

None of the premolars or second molars showed failure to drift (O-O-O) longer than one year after the extraction of the first molar. On the other hand, movement of both premolars and second

TABLE 3.—POSITIONS OF FIRST AND SECOND PREMOLARS AND SECOND MOLARS IN 941 CASES IN WHICH FIRST MOLAR WAS EXTRACTED, RELATED TO QUADRANTS OF THE JAWS

Location of Extracted Molar	PM1 PM2 M2 No Movement		PM1 and M2 = 0 PM2 Distally		M2 = 0 PM1 and PM2 Distally		PM1 and PM2 = 0 M2 = Mesially		PM1 = 0 PM2 = Distally M2 = Mesially		PM1 and PM2 = Distally M2 = Mesially		Totals	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Upper right	1	0.75	0	0	2	1.5	24	18.2	14	10.1	91	68.9	132	14
Upper left	0	0	0	0	7	4.6	28	18.5	16	10.5	100	66.2	151	16
Lower right	5	1.6	4	1.2	21	6.8	37	12.1	33	10.7	208	67.8	308	33
Lower left	8	2.2	2	0.57	27	7.1	39	11.1	38	10.8	238	68.0	350	37
Totals	14		6		55		128		101		637		941 teeth for 500 cases	
		1.5		0.63		5.8		13.6		10.7		67.6	1.88 molars per child	

TABLE 4.—NUMBER AND PERCENTAGE OF QUADRANTS IN EACH POSITION DISTRIBUTED ACCORDING TO INTERVALS FROM THREE MONTHS TO TWELVE YEARS, BETWEEN EXTRACTION OF FIRST MOLAR AND TAKING OF IMPRESSION

Time Intervals		0.3 Months	0.6 Months	Years 1	2	3	4	5	6	7	8	9	10	11	12	Total
PM1-PM2-M2	No.	7	4	3												14
O O O	%	50	28.5	21.5												
PM1-PM2-M2	No.	1	2	2		1										6
O D O	%	16.6	33.3	33.3		16.6										
PM1-PM2-M2	No.	2	2	13	14	11	1	4	4		3			1		55
D D O	%	3.6	3.6	23.6	25.4	20.0	1.8	7.2	7.2		5.4			1.8		
PM1-PM2-M2	No.	11	7	31	22	18	8	12	6	5	7				1	128
O O M	%	10.1	5.4	24.1	17.1	14.0	6.0	9.0	4.6	3.9	5.4				.75	
PM1-PM2-M2	No.	3	8	17	17	17	11	11	4	7	5	1				101
O D M	%	2.9	7.9	16.8	16.8	16.8	10.8	10.8	3.8	6.9	4.9	0.9				
PM1-PM2-M2	No.	4	16	84	92	82	77	92	62	51	49	11	16		1	637
D D M	%	0.6	2.5	13.2	14.4	12.9	12.1	14.5	9.7	9.0	7.7	1.8	2.5		0.2	

molars (D-D-M) was found within three months after the extraction of the first molar.

tions of the 941 quadrants, including all intervals, with that of the six-year interval. The close resemblance of these two

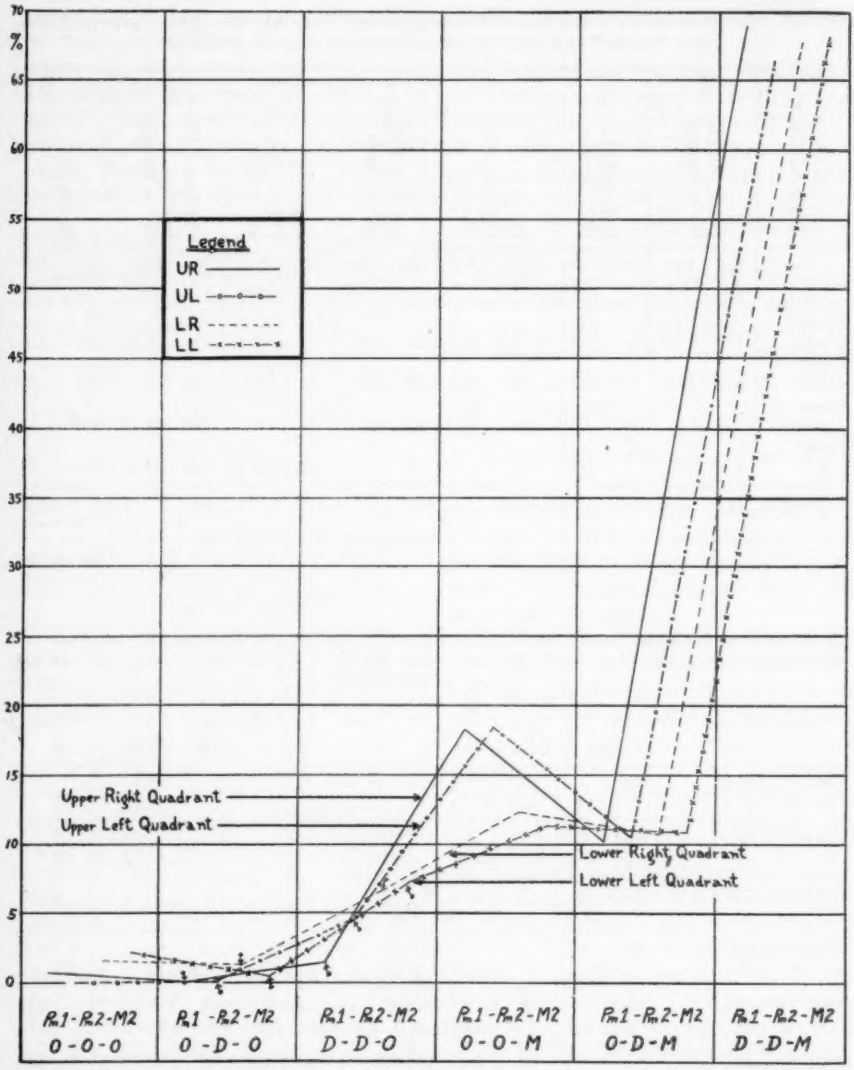

Fig. 2.—Percentage of frequency of distribution according to designated positions of first and second premolars and second molar in 941 jaw quadrants.

Figure 3 shows the correlation of the distribution in the six designated posi- distributions indicates that the interval factor is perhaps not so important as may

at first appear in the attempt to determine the positions assumed by the premolars and second molar after extraction of the first molar. Furthermore, available data to be presented in the future indicate that the younger the child when the first molar is extracted, the greater the tendency of the premolars to drift distally rather than for the second molars to come forward.

The human face undergoes tremendous changes during its course of development. It does not necessarily follow that, because identical teeth are extracted in a child, the conditions of facial growth and development will always result in the same tooth movement. We may have modifications resulting from disease, habits, endocrine relationship, nutritional disturbances and other conditions too numerous to mention. In order to cause similar changes, equal forces would have to be exerted. It is well known, however, that the forces which determine the direction and extent of facial development vary with each individual child. As pointed out by Mershon:

> Development is a series of correlated events which constantly modify the interrelated tissues as the result of growth processes. Development of one part depends upon the development of another part, and the whole elaborate process is beautifully synchronized. This harmonious interrelation of parts, in both form and function, produces the individual normal.[2]

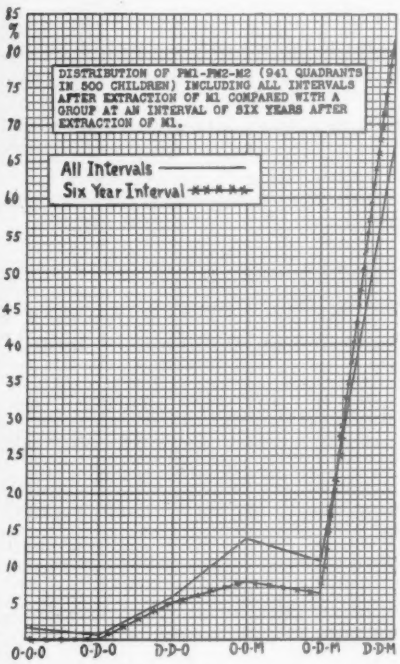

Fig. 3.—Distribution of first and second premolars and second molars (941 quadrants in 500 children), including all intervals after extraction of first molar compared with group at interval of six years after extraction of first molar.

CLOSURE OF SPACE AFTER EXTRACTION OF FIRST MOLARS

When we measured the amount of space remaining at various intervals after the extraction of the first molar teeth, we found[1] that although the space remaining tended to grow smaller as the interval after extraction increased, the rate of closure was not at all uniform in all instances. Furthermore, the space may never close completely in some cases. However, the median weighted average amount of space remaining as the interval after extraction increases becomes gradually smaller and presents a central tendency indicating the median weighted average rate and amount of space closure. Figure 4 shows a graph based on the weighted data obtained by measuring the spaces remaining in the upper and lower jaws. It can be seen that the space shows a gradual tendency to close and that at all intervals it closes faster in the upper jaw than in the lower.

COMPARISON IN AMOUNT OF MOVEMENT OF SECOND PREMOLAR AND SECOND MOLAR IN UPPER AND LOWER JAWS

Table 5 shows the median weighted

TABLE 5.—MEDIAN (WEIGHTED) AMOUNT OF DISTAL MOVEMENT OF SECOND PREMOLAR AND MESIAL MOVEMENT OF SECOND MOLAR AT DIFFERENT INTERVALS AFTER EXTRACTION OF 941 FIRST MOLARS IN 500 CHILDREN

Interval	Upper		Lower	
	Second Premolar	Second Molar	Second Premolar	Second Molar
3 Months	0.5 Mm.	1.3 Mm.	0.4 Mm.	0.9 Mm.
6 Months	1.4	2.1	1.0	1.2
1 Year	2.1	3.5	1.9	2.4
2 Years	2.1	4.3	2.6	2.8
3 Years	1.7	5.2	2.7	3.6
4 Years	2.3	5.9	3.4	3.6
5 Years	2.4	6.3	3.8	4.4
6 Years	2.3	6.5	4.3	4.4
7 Years	2.3	6.4	3.8	5.2
8 Years	1.5	8.0	4.2	5.0

TABLE 6.—SUMMARY OF EXTEETH BY AGES, 15 TO 19*

MIP = MI Present MIM = MI Missing	15 Years		16 Years		17 Years		18 Years		19 Years		Totals	
	MIP	MIM	MIP	MIM	MIP	MIM	MIP	MIM	MIP	MIM	MIP	MIM
No. children	89	71	207	200	154	147	35	58	15	24	500	500
% children	17.8	14.2	41.4	40.0	30.8	29.4	7.0	11.6	3.0	4.8	100.0	100.0
No. exteeth	609	729	1,585	1,921	1,201	1,522	262	630	118	330	3,775	5,132
% exteeth	16.13	14.4	41.98	36.4	31.81	30.2	6.96	12.5	3.12	6.5	100.0	100.0
Median average No. exteeth	6.84	10.26	7.65	9.6	7.79	10.4	7.4	10.86	7.86	13.7	7.55	10.26

*In 500 children with the first molar present and 500 with the first molar missing.

TABLE 7.—SUMMARY OF EXTEETH RELATED TO NUMBER OF MOLARS LOST PER CHILD IN 500 CHILDREN

Molars Missing per Child	No. Children	Children Per Cent	No. Exteeth	Exteeth Per Cent	Exteeth per Child
1	200	40.0	1,848	36.0	9.2
2	184	36.8	1,913	37.3	10.3
3	87	17.4	960	18.7	11.0
4	29	5.8	411	8.0	14.0
Totals	500	100.0	5,132	100.0	10.25 Average

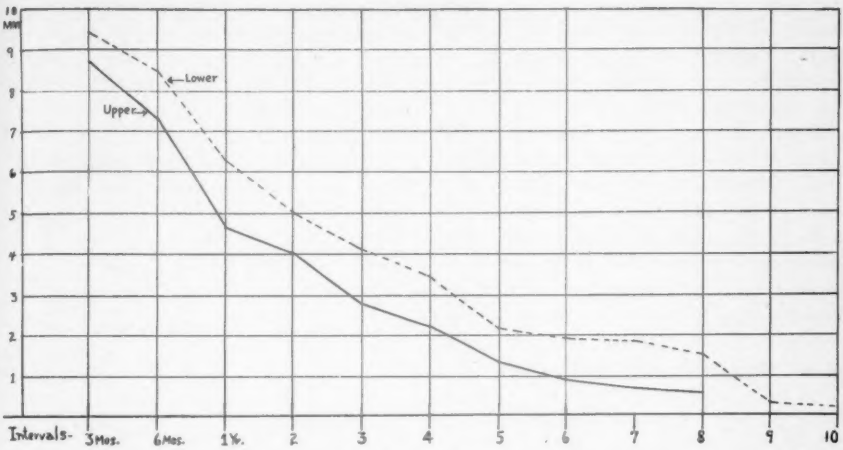

Fig. 4.—Distribution of median weighted space in upper and lower quadrants according to time intervals between extraction and impression.

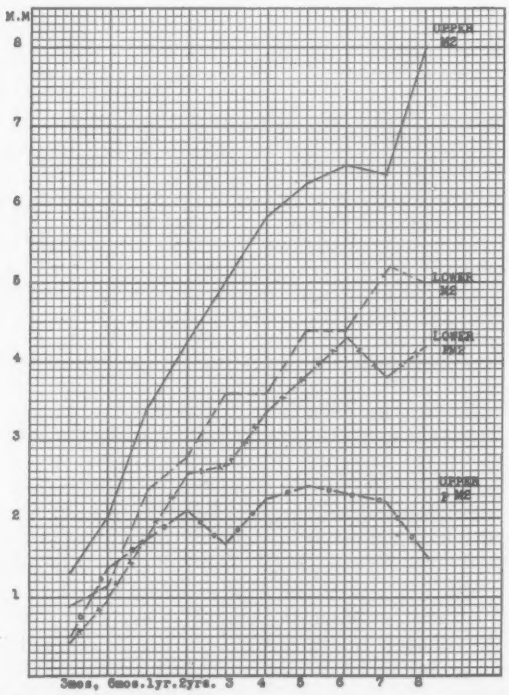

Fig. 5.—Median (weighted) amount of distal movement of second premolar and mesial movement of second molar at different intervals after extraction of 941 first molars in 500 children.

average amount of movement in millimeters of the second premolar and the second molar in the upper and lower jaws respectively, at different intervals after the extraction of the first molar .

Figure 5 is a graph based on Table 5. It can be seen here that the upper second molar shows by far the greater amount of movement. The lower second molar is next in the amount of movement. The lower second premolar shows a rate of movement closely related to that of the lower second molar. The upper second premolar shows less movement than any of the other teeth mentioned.

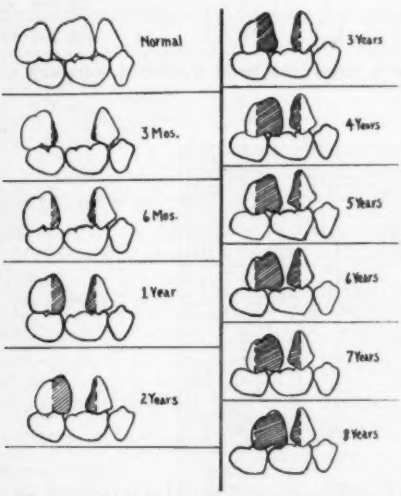

Fig. 6.—Direction and extent of movement of upper second premolar and second molar after extraction of first molar in 500 children (median weighted averages in millimeters).

Figure 6 is a graphic portrayal of the relationship at different intervals of the second premolar and the second molar in the upper jaw, to the teeth in the opposing jaw after the extraction of the first molar. It will be noted that, as the teeth move, there is a cuspal interference which is no doubt responsible for the rotation and inclination of these teeth. The effect of the disturbed occlusion resulting from the movement of these teeth can be seen in gingival disturbances and in the increase and distribution of caries.

Figure 7 shows the same relationship for the lower jaw as was shown previously for the upper jaw.

Figure 8 shows a comparison of the upper jaw with the lower when the first molars are missing in both jaw quadrants.

EFFECT OF FIRST MOLAR EXTRACTION ON CARIES INCIDENCE

A group of 500 children who had not lost any first molar teeth were examined. A record was made of the number of teeth in each child that gave evidence of caries; those that had been filled; those that had been extracted, and those that showed redecay or presented any other clinical evidence of not being physically as when erupted. Malposed and hypoplastic or otherwise apparently congenitally faulty teeth were not included in this cor-

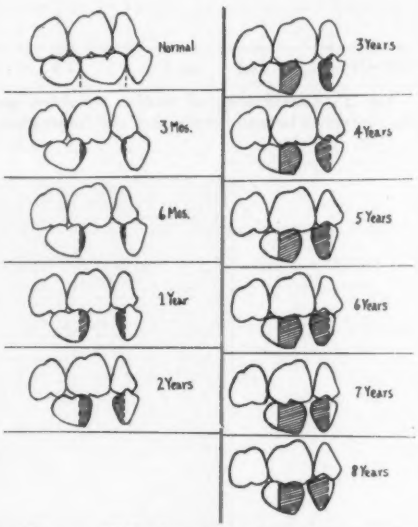

Fig. 7.—Direction and extent of movement of lower second premolar and second molar after extraction of first molar in 500 children. (Median weighted averages in millimeters.)

relation. For the sake of convenience, these teeth will be designated as "exteeth." "Exteeth" are, therefore, those teeth which are not in their original state of normality. The term "exteeth," it should be remembered, refers to the physical abnormality acquired after eruption. It does not include obviously preeruptive defects.

Table 6 shows a comparison of the 500 children with first molars missing to a second group of 500 children with first molars present. Here we see that the 500 children with first molars missing had a

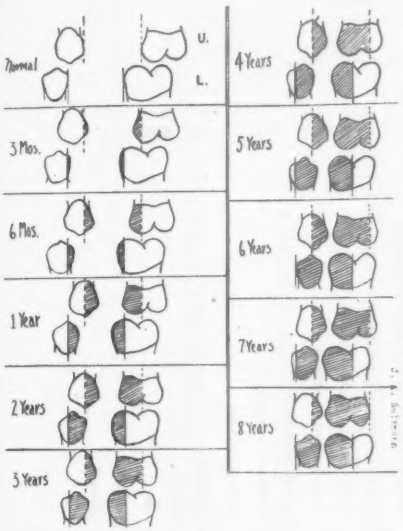

Fig. 8.—Extent and direction of movement of second premolar and second molar in upper and lower jaws after extraction of 941 first molars in 500 children. (Median weighted averages in millimeters.)

total of 5,132 "exteeth," or a median (weighted) average of 10.26 "exteeth" per child. The 500 children with first molars present showed a total of 3,775 "exteeth," or 7.55 "exteeth" per child. The group with extracted first molars showed a median average increase of 2.7 "exteeth" per child over the group with first molars present.

Figure 9 shows a correlation of the group of 500 children having one to four first molars extracted to the second group of 500 children with first molars present. The two groups of children are distributed on a percentage basis into subdivisions showing from one to twenty-one or more "exteeth" per child in each subdivision. It can be seen that when the first molars are present, the percentages in the subdivisions from 0 to 8 "exteeth" per child are higher than for those subdivisions of children with first molars extracted. On the contrary, the percentages for the children with first molars extracted, although in the subdivisions from 0 to 8 "exteeth" per child, are higher in the subdivisions from 9 to 21 or more "exteeth" per child. There is thus shown to be a definite tendency for children with first molars extracted to show more "exteeth" per child than when the first molars are present in the mouth.

Figure 10 shows the median (weighted) average number of "exteeth" per child correlated according to ages 15 to 19, for both of the groups of 500 children each. The central tendency for both groups is to show an increase in the number of "exteeth" as the child grows older. In the group with first molars present, the weighted median increase in "exteeth" is from 6.8 at 15 years to 7.8 at 19 years, a median average net increase of one "extooth" per child. However, in the group with first molars missing, the increase is from 10.2 "exteeth" at 15 years to 13.7 "exteeth" at 19 years, an increase of 3.5 "exteeth" per child.

Table 7 shows the number of "exteeth" in the group of 500 children who had lost first molar teeth, correlated to the actual number of first molars extracted per child. Here it can be seen that there is a median weighted average of 9.2 "exteeth" per child with one first molar extracted. The median weighted averages increase gradually with the increase in the number of first molars extracted per child. The average number of "exteeth" per child with four first molars extracted

is 14. Where the first molars are present, the median weighted average number of "exteeth" per child in a group of 500 is 7.5, whereas in the group of 500 children with first molars extracted it is 10.25 "exteeth" per child.

Figure 11 shows the respective percentages of 500 children in each of the two groups, between the ages of 15 to 19 years, having ten or more "exteeth." The percentages here are isometrically portrayed in the areas of molar tooth crowns. Although the group with first molars present shows 25.5 per cent to have ten or more "exteeth" at 15 years and the percentage increases gradually to 40.2 at 19 years, the group of 500 children with first molars missing shows 50.5 per cent with ten or more "exteeth" at 15 years and the percentage increases to 79.8 at 19 years. There is thus seen a definite correlation between the increase in age and the increase in the median weighted average number of children having ten or more "exteeth" per child in both groups. However, when the first molars are present, the increase is from 25.5 at 15 to 40.2 at 19 years, whereas if the first molars have been extracted, the increase ranges from 50.5 at 15 years to almost 80 per cent at 19 years of age.

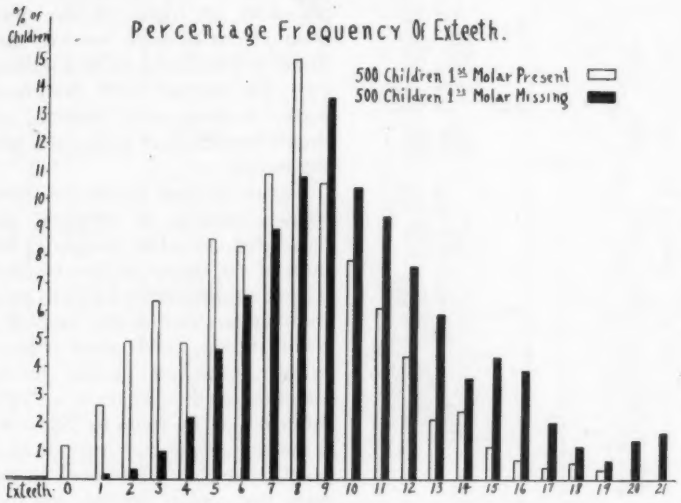
% of Children
Percentage Frequency Of Exteeth.
500 Children 1st Molar Present
500 Children 1st Molar Missing
Exteeth
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Fig. 9.—Percentage frequency of exteeth.

SUMMARY

1. An average of 1.88 first permanent molars were found to have been extracted per child in the examination of 500 children between 15 and 19 years. The actual number of first permanent molars extracted per child increased only slightly as the age (between 15 and 19 years) increased.

2. In the order of increasing frequency, first permanent molars were found to have been extracted as follows: upper right, upper left, lower right and lower left, the last being the most frequently extracted first molar. There were two and one-half times as many lower first molars lost as upper. There is a high degree of correlation as regards the frequency of loss of first permanent molars between the right and the left sides. However, the upper and lower left quadrants show an increase over the corresponding quadrants on the

right side in the number of first molars extracted.

3. A study of the change of positions of the first and second premolars and second molar in the 941 quadrants examined shows 67.6 per cent with distal movement of the premolars and mesial movement of the second molars (D-D-M). Five and eight-tenths per cent showed distal movement of the second premolars only (D-D-O) and 13.6 per cent showed movement of the second molar mesially only (O-O-M). It is the latter type of movement that those who extract first molars as an orthodontic aid expect to find in all cases. The D-D-M position only was found to prevail after an interval of eight years between the time when the first molar was extracted and the examination was made, whereas quadrants showing other positions tended to disappear as the interval of time since the extraction increased.

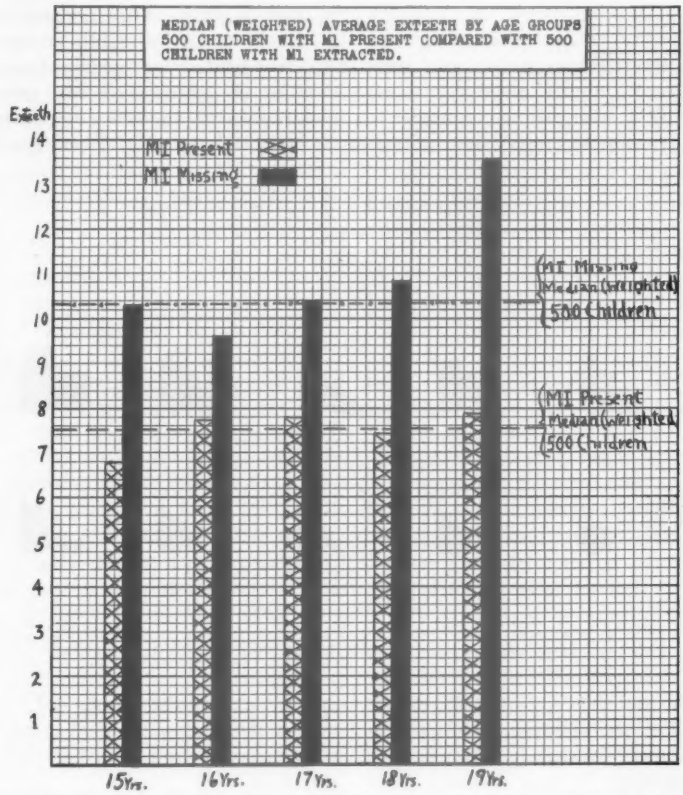

Fig. 10.—Median (weighted) average exteeth by age groups in 500 children with first molar present compared with 500 children with first molar extracted.

4. When the first and second premolars and second molars in the quadrants from which the first molars had been extracted are distributed in the six designated positions of movement studied, without regard to the interval of time elapsing since the extraction, they are found to show a

high degree of correlation to the distribution evidenced by quadrants at definite intervals. This shows that the time interval between the extraction of the first permanent molars and examination for the present study is of no great importance in attempts to determine the positions assumed by the premolars and second molar after the first molar is extracted.

5. "Exteeth," i.e., teeth showing some physical abnormality acquired since their eruption, were found in greater numbers in 500 children who had lost from one to four first permanent molars than in children with the first permanent molars present. The 500 children with first permanent molars present had a weighted median average of 7.55 "exteeth" per child. The group of 500 children with one to four first permanent molars extracted had a weighted median average of 10.6 "exteeth" per child.

6. When the two groups of 500 children were compared according to the number of "exteeth" per child, from none to twenty-one or more, children with first molars missing were more frequently found to have higher percentages of "exteeth" per child. The children with first molars present showed higher percentages in the subgroups from 0 to 8 "exteeth" per child, whereas those with first permanent molars extracted showed higher percentages of "exteeth" in the subgroups, from 9 to 21 or more "exteeth" per child.

7. The number of "exteeth" per child increases as the child grows older, between 15 and 19 years. This increase amounts to one "extooth" per child in the group with first permanent molars present. However, in the group with first permanent molars missing, there is a net increase of 3.5 "exteeth" per child. There is a definite increase also in the number of "exteeth" per child with the increase in the actual number, from one to four first molars, lost per child.

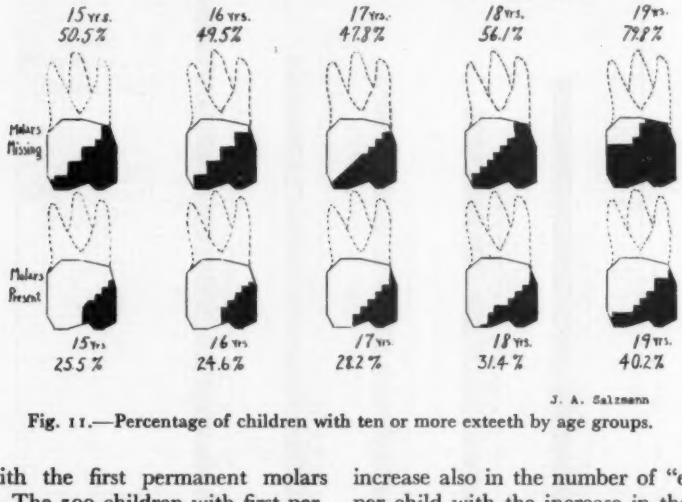

Fig. 11.—Percentage of children with ten or more exteeth by age groups.

8. In every group between 15 and 19 years, there were twice as many children found to have ten or more "exteeth" per child in the group with first permanent molars extracted as compared with the group with first permanent molars present.

9. The space remaining after extraction of the first permanent molar was found to decrease in size as the interval

between extraction and examination increased. The closure of the space was not uniform in all cases, and was found to be affected by environment, habit and other conditions. The space in the upper jaw was found to close at a faster rate than that in the lower jaw.

10. The upper second molar shows the greatest amount of movement when compared with the upper second premolar, lower second molar and lower second premolar respectively. The upper second premolar showed the least amount of movement. The amount of movement of the lower second molar and that of the lower second premolar showed a high degree of correlation.

CONCLUSIONS

The harmful effects following extraction of first permanent molars are well-defined in adolescent boys and girls nearing the final stages of growth and development. Contrary to the belief held by some, the second molars do not come forward alone to occupy the space left vacant by the extraction of the first molar. A general disturbance of the occlusion of the teeth manifests itself. The younger the child when the first permanent molar is extracted, the greater the harmful effects on occlusion and the higher the caries incidence. There is a concomitant increase in the incidence of "exteeth," i.e., teeth not in their original physical state as at the time of eruption, in children between 15 and 19 years of age. This increase in "exteeth" shows a high degree of correlation with the increase in the number of first molars lost. The space left after extraction of the first permanent molar does not close uniformly in all cases because of individual factors in the case. It closes faster in the upper than in the lower jaw. The maxillary second molar shows a comparatively greater amount of change in position than the maxillary second premolar or the mandibular second molar. The mandibular second premolar and second molar show a close relationship in the amount of change of position at various intervals after the extraction of the first molar.

The effects of first molar extraction are manifested in the increase in caries, occlusal disturbances and changes in facial contour and appearance and frequently in interference with speech and general physical growth and development. The fact that the average boy and girl at 15 years has had almost two of his first molars extracted is additional proof that periodic dental examination and treatment when necessary must start as soon as the teeth erupt. The havoc initiated in the dentition as a whole by the extraction of the first permanent molar teeth without some provision for space maintenance for the preservation of the occlusal relationship is a fact that must be recognized, publicized and prevented by the practicing dentist.

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PAIN CONTROL IN DENTISTRY

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THERE are two phases of pain control which must be considered, the physical and the mental. There are also two angles from which the mental side is to be regarded. Over one angle of the psychic phase, we have no control, but there is another angle which we can more or less regulate. The first consists of those influences which surround the patient before he enters our office. This influence begins at birth, for every newborn baby is carrying the affects of the experiences and fears of its progenitors and, after its birth, the child begins to be affected by its environment and education. Much of that which is read, seen or heard of dentistry, by the laity, leads them to expect pain when they visit the dentist. Many persons are loth to admit that they suffered no pain in the dental chair, but prefer to pose as heroes, and they exert an influence on listeners, who go to the dentist with fear and trembling. Imagination plays an important part. A cold piece of iron hurts just as much as a red-hot piece if we believe that it is red-hot when it touches us. It is fear of pain which we have to overcome, not the actual pain. There is no operation in dentistry which cannot be performed without actual pain.

Modern methods and a moderate amount of skill make this possible. We can operate painlessly, but we need help in educating the public regarding this fact. All influences now foster fear, instead of helping to eliminate it. Newspapers and other periodicals, especially, do this.

Does organized dentistry do anything to teach people that pain is unnecessary in any dental operation today? It does not. On the contrary, it helps foster the belief that dental treatment is painful. Two years ago, when the public was told that Dr. Hartman had discovered a means of making cavity preparation painless, did we inform the public that painless cavity preparation had been possible for several years? Did we tell them that painless dentistry had been instituted in dental practice with no band music or newspaper publicity; that no one could say just when we did begin painless cavity preparation, and that no one knew who first used procaine injections for these operations? We did nothing of the kind. Instead, we gathered together from all points east, west, north and south at a mammoth meeting to hail the discoverer of "painless dentistry." With flags flying and bands playing, we celebrated this "discovery."

At the A.D.A. meeting in Minneapolis in 1928, I demonstrated the use of the peridental injection to render cavity preparation and pulp removal painless. Men who later were most enthusiastic advocates of the Hartman method saw that clinic and questioned at that time the advisability of making cavity preparation painless because of the possible injury to the pulp during the preparation. The danger of pulp injury because of lack of response to sensation has been greatly exaggerated. There is more danger of unnecessary exposure when dependence is placed on the reactions of the patient than when one depends on his own knowledge of tooth anatomy. Cer-

(Read at the Philadelphia Midwinter Meeting, February 1938.)

tain patients make no response when the pulp is approached. Most of us can remember making exposures without a sign from the patient. If we know there is no possibility of a patient's reaction, we are more careful and exercise proper skill.

It is time that we as a profession began to teach the public that pain is not a necessary accompaniment of dental operations. It is time that we began to plead with publications to cease the linking of pain and dentistry in their articles, and it is time that we begged the jokesmiths to look for new sources of material. Fear of the dentist is the result of psychic impressions from various influences with which the patient is in constant contact, and we ourselves are helping in some ways to foster this fear. When the public understands this and also understands that better and more thorough operations are possible when pain is eliminated, every dental practice will show a decided increase; for more people neglect the teeth because of fear than for all the other reasons combined.

The second angle from which the psychic phase of pain control is to be considered is based on what occurs after the patient enters the dental office. As pain and discomfort are often confused by the patient, every effort should be made to avoid discomfort of any kind.

A diversion of the mind will often cause the patient to forget an imagined pain. The plan of Dr. Best of having a radio earphone attached to the headrest has merit. Several operators have suggested showing moving pictures on the ceiling. Shirley H. Dwyer gives his nervous patients and child patients a hand mirror to get them interested in the operation. E. A. Holbrook mentions an experience with a boy of 12 years who was a particularly difficult patient:

> One day he had been extremely uneasy, when he suddenly relaxed, and although the work continued in the same sensitive cavity, he seemed not to mind it. On being asked if the tooth still hurt, he said he did not know because he had been counting the windows in a house down the block.

A distraction may not prevent actual pain, but it can prevent imagined pain, and we do know how to prevent actual pain. We can control the physical, but not always the mental. A patient comes to the office with an inborn fear of dental pain, which may have been increased by environmental and educational influences. We have to overcome this fear and we certainly should do nothing to add to it.[1]

There has been a constant search for a method to control pain ever since the beginning of the practice of dentistry. General anesthesia, the greatest blessing ever bestowed upon mankind, is the result of an attempt by Dr. Wells to control dental pain; and many methods have been offered since. My first recollection of a popular method of pain control is of the almost universal use of cataphoresis. Wilbur F. Litch, in his address as president of the Pennsylvania State Dental Society, July 12, 1898, said, "Cataphoresis as a method for obtunding sensitive dentine and anesthetizing exposed pulps preparatory to their extirpation has probably secured a permanent place in our armamentarium."[2]

No office was complete without a cataphoric outfit, and I often wonder what became of them all. Then there followed an era in which various drugs were used, ranging from sulfuric acid to sodium bicarbonate. The fact that the tooth had to be dehydrated before and after application of the desensitizer was probably the reason for the alleged success of many of these drugs. It is easy to desensitize any tooth by dehydration, and only a little time has to elapse before it is discovered that the tooth is devitalized as well as desensitized. This method also fell into the discard, after which ethyl chloride took the lead in popularity for a time. This drug was of great value and it still is when properly used and under certain conditions.

Almost every drug in the pharmacopeia has been used at one time or another as an obtundent or desensitizer and extravagant claims have been made for nearly all of them. Both the Osserman and the Hartman solutions are effective in some situations, but there are so many cases in which they cannot be used and such uncertainty as to their effectiveness, even when they are applicable, that much time can be wasted in futile attempts to get results. There is a place for these obtundents, but not the place we hoped there would be. If we do not try to use them promiscuously, they will prove to be valuable additions to our medicine cabinets.

Topical anesthetics also have a place in the armamentarium of the dentist. A topical anesthetic is useful in scaling and in curetting pockets. It is also of value for anesthetizing the gum tissue before inserting the hypodermic needle.

If the anesthetic is confined in a rubber cup and pressure is used to force it into the tissues, then good results will be obtained.

A topical anesthetic does not and cannot be expected to give more than a superficial anesthesia, *i.e.*, just enough that the needle can enter the mucous membrane painlessly, but not enough to give anesthesia to any depth. No topical anesthetic is necessary in making the mandibular injection because of the meager nerve supply at the point of entry. Neither is it necessary if the preliminary injection is peridental.

More than twenty years ago, I one day made an injection in the gingival trough of a lower incisor for the purpose of anesthetizing the gum so that the dam might be applied without discomfort. I had been preparing a gingival cavity which was extremely sensitive and, to my surprise, I found that after the injection was made, the cavity was no longer sensitive. As this seemed to me important, by similar injections I verified the fact that it was the injection which had desensitized the cavity. I gave clinics for a number of years on this method and the technic of its use.

THE PERIDENTAL INJECTION

The peridental injection can be used on any tooth in any position if the investing tissues are healthy. It is of particular value in operating on children, provided they have no fear of the hypodermic needle. In young patients and adults who have a peridental membrane of fair thickness, it is nearly 100 per cent effective. I have used it on many hundreds of teeth for cavity preparation and pulp removal, and I have never seen any unfavorable local reaction when it was used on teeth with a healthy periodontium.

I used it regularly on lower molars for pulp removal before we had the alkalized solutions of procaine, and anesthesia was possible without the long wait which had to follow a mandibular injection. The statement that injury of the tooth results from this injection had not been verified in my experience. It hardly seems necessary to speak of the need of flooding the gingival trough with iodine solution before the needle is inserted. I believe that the solution suggested by Dr. Prinz is the most effective: iodine, 2 parts, glycerine, 1 part, and acetone, 3 parts.

We find the short so-called "dental" needle useful in making this injection. The needle is carried under the free margin of the gum with the beveled point resting against the surface of the root, the orifice next to the tooth. With the syringe approximately parallel with the long axis of the tooth, the needle is wedged between the tooth and the process, with some force. When the needle is seated, pressure is exerted against the plunger, and, if there is considerable resistance, injection of 4 or 5 drops of the solution is continued. The greater the resistance encountered, the less the

amount of anesthetic needed. If there is no resistance to the plunger, the liquid is regurgitating and, of course, does not go toward the apex. In this event, the needle is wedged with a little more firmness into the space between the tooth and process or shifted slightly. Entry is made in the interproximal space, a separate injection being made for each root.

The peridental injection is now limited largely to children's teeth, because the new anesthetic monocaine or the alkaline solutions of procaine have made it unnecessary to use it in many other cases. As an initial injection in infiltration, it is of use because, if care is taken, this injection can be made without pain and the tissue anesthetized so that the deeper insertion of the needle will cause no discomfort. When the peridental injection is used, there is no waiting, for the results are immediate. I cannot too strongly emphasize the fact that it is the ideal method to use with children.

Dr. Otte[3] first used the intra-osseous injection, in 1896. A fine Beutelrock drill, a Gates Glidden drill or a bur of the same gage as the needle is used to penetrate the cortical layer. The hole is drilled at the crest of the alveolar ridge. Anesthesia is very rapid and disappears in about ten minutes. This is valuable when other methods fail.

INFILTRATION

Infiltration is the most certain of all methods of pain control for operative work on teeth in which it is applicable, with the exception of the intra-osseous injection, which is not ordinarily used because of the short period of anesthesia. The initial injection can be made without pain if either of the methods which I have mentioned is used. With a third method, the needle is held in place with the lip or cheek drawn tense and, by a sudden pull of the lip, the tissue is drawn over the needle, instead of the needle being pushed into the tissue. Someone, at sometime, decided that the subperiosteal injection would cause postoperative trauma, and, like some other theories, this has been accepted apparently without trial. It is possible that, with the old acid solution, trouble might have developed, but even then it was probably caused by too rapid ejection of the liquid. With monocaine or an alkaline solution of procaine, there is absolutely no danger of trauma except from too rapid injection. A deeper and quicker anesthesia is produced by subperiosteal injection than by supraperiosteal. The point of the needle should engage and pass under the periosteum. At all times, injection of any type should be slow, but particularly this one.

It is possible now to anesthetize the lower molars sufficiently deeply for cavity preparation or pulp removal in two minutes or more, with the mandibular injection. (It is very seldom that over five minutes is necessary.) These quick results are possible with monocaine.

VARIOUS CONDUCTION INJECTIONS

Among other conduction injections which should be considered are the deep and the superficial posterior palatine canal, the anterior palatine, the infra-orbital, the tuberosity, the mental and the posterior infra-orbital. Various authorities describe the technic of the posterior infra-orbital injection as comparatively simple. As this paper is primarily a consideration of anesthesia for operative dentistry, and as we have no particular use for this injection in operative work, I shall not dwell on the technic except to quote from Nevin's book, "Conduction and Infiltration Anesthesia":

> The posterior infra-orbital injection is not more difficult than any other nerve blocking injection. For the dental surgeon in his daily routine, the field of application is not as wide and his work on the superior maxilla could be performed with greater ease and more certain results by means of other injections.[4]

The deep posterior palatine injection is

made by carrying the needle through the canal until the region of Meckel's ganglion is reached and then depositing the solution. This injection enables us to anesthetize practically all the nerve supplying the maxilla. The solution should be forced up and the second division reached. In this injection, although the danger of breaking a needle may be slight, the results, in case of such an accident, would be so disastrous that I prefer to avoid the injection, if possible. The superficial posterior palatine injection is useful in extraction since it anesthetizes the soft tissues of the posterior portion of the palate.

THE ANTERIOR PALATINE INJECTION

The anterior palatine injection is employed to anesthetize the soft tissues of the anterior portion of the palate and is useful only in exodontia and surgery. A deep injection is sometimes made in the anterior palatine canal to reach a branch of the nasopalatine nerve, which occasionally innervates the incisors. I prefer infiltration in this condition, more particularly because the failure of the infra-orbital injection to anesthetize the incisors is more often due to anastomosis with the nerves of the opposite side. The injection is usually a painful one, but this can be mitigated by inserting the needle in the already anesthetized tissue labially between the two central incisors. The needle is carried through from the labial to the palatal surface, the solution being forced ahead of the needle. After this procedure, the anterior palatine injection can be made much less painfully.

THE INFRA-ORBITAL INJECTION

When properly placed, the infra-orbital injection will often anesthetize all three branches of the infra-orbital nerve, but it also presents the possibility of sending the patient home with a black eye. There is little occasion to use this injection for operative work as the same results can be obtained with infiltration.

We inadvertently make a tuberosity injection much of the time when we infiltrate the upper molars. The needle is inserted in the buccal fold over the distal root of the second molar. If the needle is carried straight and parallel with the long axis of the tooth, the posterior branch may be anesthetized, but, as this sometimes fails, a more certain method is to carry the needle in at an angle of 45 degrees and deposit the solution at the point where the posterior branch enters the maxilla. More than one inch of the needle should never be inserted, and three-quarters of an inch is usually sufficient.

THE MENTAL INJECTION

The mental injection gives a very deep and lasting anesthesia, especially indicated for operative work, and would be most valuable, except for the possibility of severing or injuring the mental nerve with the needle, which causes a most uncomfortable paresthesia. The danger of this is lessened by using a fine needle (27 gage). It is sometimes difficult to locate the mental foramen and also to carry the needle in to a point deep enough to get good results. Josef Novitzsky, of San Francisco, has demonstrated that branches of the mylohyoid nerve sometimes enter the mandible at a point on the inner plate near the genial tubercles.[5] The mylohyoid has, in the past, been considered a motor nerve, but it must carry some sensory fibers as otherwise it would not enter the bone. This probably accounts for the fact that it is not always possible to completely anesthetize the incisors by mandibular injection and it also explains why the mental foramen injection, properly placed, assures desired results.

MONOCAINE

We had a nice theory to explain the rapidity of action of the 7.4 solution. This

was in effect that, with an acid solution, a definite time was required for the body fluids to neutralize the solution until a pH approaching that of the body was reached, and the osmosis of the anesthetic to the inner portion of the nerve sheath did not begin until this neutralization had taken place. This seemed a perfectly good theory until I began to work with monocaine, when I found the results even more prompt than with the alkaline procaine solutions. This seemed to disprove the theory, because monocaine has a pH of about 5. I wrote to several men who I thought might offer an explanation. The consensus of opinion was that anesthesia is obtained more quickly with monocaine because of its increased potency. In the concentration used, monocaine is several times as potent as the procaine 2 per cent solution. Dr. Bloom suggested that we procure some monocaine tablets made with a pH of 7.4 to see whether the increase in pH increased the rapidity of its action. These tablets have been promised to me by the manufacturers and I will give the results in a later paper.

The results obtained with monocaine from infiltration or conduction anesthesia or peridental injection are so certain, so quick and so lacking in discomfort to the patient that it seems unnecessary to experiment with other methods of anesthesia, all of which, up to now, have been more or less uncertain and none of which is always effective. The one disadvantage of procaine anesthesia for operative work has lain in the material and not in the method. Certain operators cannot use it because it causes them to have a dermatitis. In certain cases, a local disturbance does follow the injection, and some patients get the "jitters" whenever procaine is injected.

Monocaine (mono isobutyl amino ethyl para-amino benzoate hydrochloride) is a newcomer in the field of anesthetics. It was developed by Samuel D. Goldberg after a series of investigations. From the evidence available, it seems to be an anesthetic which can be made up in a stable solution, is more potent than procaine, has no disagreeable or dangerous systemic effects and acts rapidly. The solution ordinarily used is 0.75 monocaine and epinephrine 1 :75,000. Dr. Goldberg requested me to try the anesthetic and report my findings. I suggested having a number of others do the same. I believed that the reports given by the group, whom I was to select, would be of much more value than that of a group not so carefully chosen. Every person of the group of twenty-five whom I asked to try monocaine is an operator of more than ordinary ability.

The results which I obtained with monocaine and the results obtained by this group were remarkable. Not an individual of this group reported any sign of physical discomfort following an injection and some have used it on patients who have always reacted unfavorably to procaine injections. No one has reported a failure, and all are agreed that the anesthesia has a more rapid onset than from any solution of procaine which they have used. Nearly all are agreed that there is more profound anesthesia than with procaine. The twenty-five investigators made between 600 and 800 injections and I have made 400 or 500. Every type of injection has been made and for every type of operation.

I made a preliminary report at Atlantic City regarding monocaine, in which I made a statement that must now be changed because more data are at hand. I said, "It is not claimed that monocaine is a more effective anesthetic than procaine, with a pH of 7.4, for that is just about perfect as far as efficiency is concerned." Further investigation has convinced me that monocaine is much more effective than procaine. It gives a deeper anesthesia and it appears to be much safer and the onset is much more rapid. Present information indicates that it will

not cause dermatitis. It is a stable solution which can be boiled without losing any of its efficiency. Death from toxic doses, in animals, is due to respiratory failure, not cardiac, as the solution apparently has no effect on the heart, having been used in a number of cardiac cases without any untoward results. It has no cumulative effect, as it is broken down in the liver.

I have used monocaine successfully in operations in a 1 per cent solution without any epinephrine. In this solution, it takes longer for anesthesia to develop (about ten minutes) and it lasts a shorter time (about fifteen minutes). The ordinary 0.75 solution with epinephrine 1 :75,000 has one record of anesthesia lasting over five hours. I have had, in my office, cases of perfect anesthesia lasting for ninety minutes after a mandibular injection. It is hard to get these records outside of institutions because patients do not wait for the operator to determine how long anesthesia lasts.

I have before me the report of B. G. Wakefield, professor of oral surgery at the University of Buffalo, on forty-three cases, forty-two marked "anesthesia profound," and one, "anesthesia poor," with a footnote "neurotic patient." The onset occurred in from three to five minutes in all cases and every type of injection was made. There was no evidence of pallor, trepidation, perspiration or fainting in any case. Postoperative results were all normal and in one case there was anesthesia of five hours and seven minutes' duration after a mandibular injection.

Dr. Goldberg has tabulated clinical reports from 3,043 injections. These were but a part of the 150,000 injections which have been made, but they are those made by men who kept a careful record of cases. These reports show complete anesthesia in 93.5 per cent of the cases. In the 6.5 per cent of the cases which did not show deep anesthesia were all of those which were the result of poor technic. The reports were made by seventy different men, and there were bound to be some among them who did not place the solution properly. Many times, failures are attributed to the material used, when in reality they are the result of lack of knowledge or skill on the part of the operator. That was largely avoided, I think, in the group which I chose. Of the 3,043 cases, postinjection pain was present in three, and this might possibly have also been due to poor technic. There were eleven reports of physical disturbance, or one in about every 300 cases. Some of these too, in all probability, were due to mental rather than physical conditions.

Someone may remark that clinical evidence is unscientific and means little. That may be so when the evidence of one man only is considered, but when 100 men obtain the results which I have presented here, the evidence has value, and great value.

If the experience of the men whose reports I have mentioned, if the experiences of the 100 men whose tabulations I have is an indication of what the experience of the whole profession is to be, I trust that the problem of painless dentistry is definitely solved.

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PROCEDURE FOR CONSTRUCTION OF ALL CAST PIN ONLAY

By HAROLD J. CUTLER, D.M.D., Boston, Mass.

THE usual procedure for the pin type restoration calls for the use of pins or wires in both the impression taking and the waxing for casting. The following procedure eliminates the use of these wires and pins in both instances.

Description of the preparation and construction of a cuspid pin onlay, typical of such restorations, follows:

Fig. 1.—Outline of slice on proximal surface.

Fig. 2.—Outline of slice on mesial and distal surfaces. These two areas are connected when palatal relief for the thickness of the metal is made. There is a generous bevel along the line marked x-x for strength in casting.

The convexity is removed mesially and distally as for a slice or flap preparation. (Fig. 1.) The direction in applying the carborundum disk should be through the contact point, from palatal to buccal surface with the disk inclined toward the incisal edge and parallel to the proximal surface to be prepared. (Figs. 4-5.) By alternately blackening, with a lead pencil, the surface being prepared and then grinding with the flat side of a carborundum stone, the exact outline of the slice is revealed and the presence of an undercut easily determined.

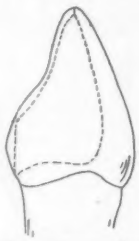

Fig. 3.—Outline of completed preparation showing extent of slice palatal relief, incisal bevel and removal of convexity below cingulum.

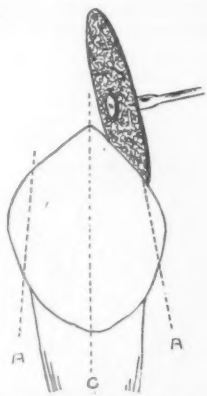

Fig. 4.—Buccal aspect; carborundum stone applied from palatal to buccal aspect parallel to proximal surface A-A′ and inclined toward long axis of tooth (C).

The prepared mesial and distal surfaces are connected by removing the convexity on the surface between cingulum and gum, and grinding the palatal surface to relieve the bite and permit a sufficient thickness of gold. (Fig. 3.) The angle formed by the junction of the mesiopalatal and distopalatal surfaces (Fig. 2) should be well beveled for added strength in the casting.

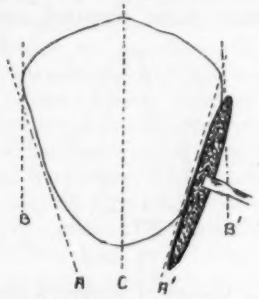

Fig. 5.—Incisal aspect; mesial and distal cuts made with stone parallel to surface to be prepared. A-A′, correct line of application inclined toward C at incisal. B-B′, incorrect line of application.

Fig. 6.—Steps cut on palatal surface with small cylindrical stone applied parallel to long axis of tooth.

With a small flat end cylindrical stone, three seats are cut in line with the long axis of the tooth. Two of these steps should be on the palatal surface near the incisal edge, just in from the mesial and distal surface. The third step is made at the highest point of the cingulum. (Figs. 6-8.)

A copper band for impression taking is fitted at this time. It is most important that this be done before the pinholes are made, as this procedure utilizes snap impressions to help parallel the pinholes. The band is fitted mesially, distally and palatally to the gum and relieved on the buccal aspect to free the height of contour. This relief of the band on the buccal aspect is most important, as it permits the withdrawal of the impression in line with the long axis of the tooth. (Fig. 9.)

Fig. 7.—Pinholes cut to depth of 2 mm., first with No. ½ round, then with No. 700 tapered fissure, bur. The edges are beveled with stone.

Fig. 8.—Two pinholes, one distal, one mesial, on palatal surface near incisal aspect and one pin hole at cingulum.

First, with a No. ½ round bur, one hole is drilled to a depth of 2 mm. parallel

to the long axis of the tooth. This is followed by drilling with a No. 700 tapered fissure bur to the same depth. All edges and the entrance to the pinhole are carefully beveled with a small tapered stone. (Fig. 7.)

A snap impression is now made to be certain that the band covers the preparation as made, and that it can be successfully removed in line with this pinhole and preparation. The tooth is isolated, washed with warm water and dried. The

Fig. 9.—Band fitted to follow gum outline except where relieved at height of contour on buccal aspect; holes drilled at cervical edge o-o-o to prevent compound creeping away from band.

Fig. 10.—Slight surplus of compound ahead of band as it goes to place.

pinhole and tooth are lubricated with Kerr lubricant. The copper band is filled with compound, softened in a flame and pressed to position, the compound being ahead of the band as it goes to place. The tube is held in position with one hand, and with the blunt end of a small instrument in the other hand, the compound is forced with three or four strokes into the pin holes before the final pressure is exerted with the finger. The impression is carefully examined for imperfections or undercuts.

A second hole is drilled with a No. $\frac{1}{2}$ round bur, followed by a No. 700 tapered

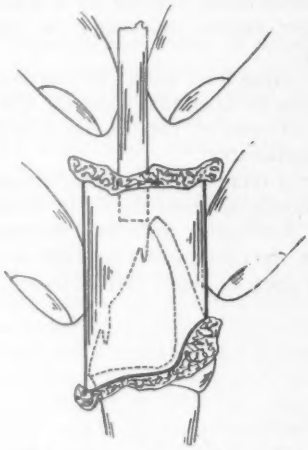

Fig. 11.—Band held in position with fingers of one hand; compound forced into pinholes with blunt end of instrument in free hand.

Fig. 12.—Band still held in position, final pressure being made with finger of free hand.

fissure bur, but only to a depth of 1 mm. before parallelism is verified by another snap impression, using the same band and fresh compound where needed. The pin-

hole is drilled to proper depth, alinement being corrected if necessary, and again verified with a snap impression.

Two pinholes parallel to each other having been completed, a third hole is drilled first to a depth of 1 mm., the alinement being verified by a snap impression before proceeding to proper depth.

By taking these numerous snap impressions, as the operation proceeds, it is possible to parallel two or more pinholes in a preparation.

For a final impression, the compound in the original band should be freshened and thoroughly softened throughout. Again, the compound is kept ahead as the band goes to place. When seated, it is

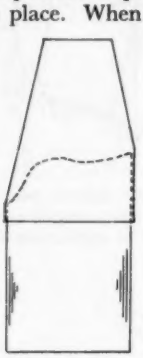

Fig. 13.—Copper band and impression wrapped with sheet wax extension to form root for die.

held with one hand while the compound is forced into pinholes with a small blunt end instrument, and then by the finger of the free hand. The compound is chilled and the excess removed to relieve undercuts and permit withdrawal along the line of the long axis of the tooth. Should the compound crawl or stand away from the band, a few holes drilled through the band with a No. 1 bur will offer a roughness and a flare on the inside that will prevent this discrepancy. (Figs. 9-12.)

Thin sheet wax is wrapped around the band, a form being built up to nearly the equivalent of the depth of the impression. The band, with wax extension, is embedded in plaster in a tapered metal or paper ring. The impression is not packed with an instrument, but, by tapping this plaster mold on the bench, as small wet pieces of technic amalgam are placed in the mold, the impression is covered. Then with the remaining mix, free of excess mercury, the mold is filled. All excess mercury is removed with pressure. No amount of force, up to fracture of the plaster reinforcement, will distort the impression. (Figs. 13 and 14.)

The die thus obtained should be an exact duplicate of the prepared tooth. The die is articulated from a wax bite in the usual manner. The surface and pinholes of the die are oiled and waxed

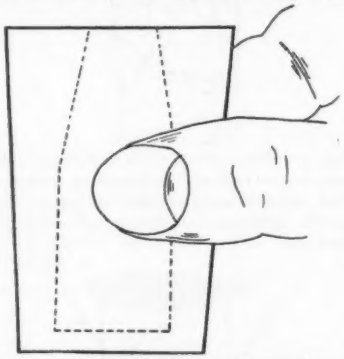

Fig. 14.—Copper band and extension embedded in tapered metal ring filled with plaster. Small moist pieces of the amalgam mix are dropped into the mold and packed by vibration from tapping the metal ring on the bench top.

as for any other restoration, wax being carried to the depth of pinholes with a heated instrument.

The pattern is removed and examined for discrepancies and, if satisfactory, invested and cast. Any method that has proved successful to the individual operator for casting should be just as successful for this type of restoration.

It is possible, by this procedure, to construct an all cast pin onlay that will be efficient and serviceable.

47 Bay State Road.

LOWER IMPRESSION MAKING

By Dayton Dunbar Campbell, D.D.S., Kansas City, Mo.

ONE should not confuse the simple "taking" of an impression with impression "making," since taking an impression implies that the negative result is unaccompanied by any distortion of the tissues, accidental or intentional. When we begin relieving, postdamming, tissue-trimming, etc., we assume the rôle of an impression maker, but this step in full denture construction is ofttimes so shrouded in mysticism by the operator that a halo is thrown above him which is not permitted the uninitiated.

Whether essayist or clinician in his demonstration is aware of this tendency to show only superior results, uncontrasted with contraindications, is beside the point. It is my contention that the effect on the student dentist is inimical to healthy progress and that the teacher will not make any record-breaking strides as a pedagog.

It is my intention to divest this subject of its glamour and intricacies. First, let it be stated accurately that retention of the lower denture is of third importance in the sequence of steps in the construction of a full denture. It is preceded in importance by centric relation of the mandible, and both retention and centric relation are dependent on occlusion.

The study of retention is so inextricably bound up with the physical, physiologic and psychologic factors that prognosis ofttimes resolves itself into a guessing contest. Take the physical, physiologic and psychologic factors functioning to the *n*th degree in the person of an edentulous Atlas, who in mythology is supposed to have supported the world on his head and shoulders, and could swing the world by his teeth, and contrast with him a diminutive grandmother, anemic and emaciated, peevishly impelled by her children to get "fixed up," and you have the two extremes.

A dental student might be able to take an impression of the mouth of Atlas and make a cast from which a denture could be made that would bring forth from this patient praises of efficiency and comfort; whereas the most exacting prosthetic operator could not cope with the frail little old lady with her spinous ridge and her attending loved ones.

Principles of retention are, in the making of a lower impression, to be regarded more than are certain methods or certain materials. This statement might well be axiomatic. If memorized, it might be a cure for those who have an insatiable desire for the spectacular.

All other conditions remaining constant, the larger the area to be covered by the denture, the greater will be the retention. That is why, when we secure phenomenal retention in a lower denture and experience a warm glow of satisfaction over our superior ability, we should note that the patient as a rule weighs about 200 pounds and has difficulty getting his denture in and out of an ordinary 8-ounce water-glass.

Every textbook published on prosthetic dentistry deals with this factor of area in a thoroughgoing manner, and differentiates in a concise and understandable way the advantages to be secured by in-

(Read before the Section on Full Denture Prosthesis at the Seventy-Ninth Annual Session of the American Dental Association, Atlantic City, N. J., July 13, 1937.)

corporating all of the available seating area possible, as well as emphasizing the attending evil of relying on atmospheric pressure as a positive, lasting aid. Yet the largest audience in the clinic room is held by the dentist who is taking an impression or extracting a tooth. Preventive dentistry and orthodontia, of much more vital importance to the human race, are shunned by the majority of dentists on their trek for knowledge. What is it that lures the crowds to these spectacular clinics and exhibitions? We answer our own question: it is the economic phase. No branch of our profession pays better dividends on time and energy spent, provided the dentures are successful; and

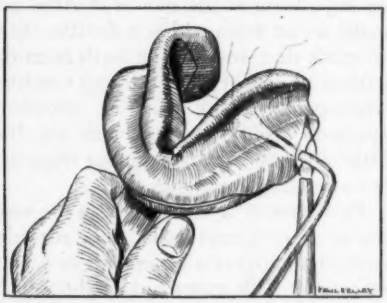

Fig. 1.—Flame projected against tissue surface of one of well-supported lingual flanges in area adjacent to mylohyoid muscle.

the removal of teeth is not usually associated with recurrent trouble. Is not this the answer?

At the risk of being verbose and pedantic, I again call your attention to the five physical factors in the retention of an artificial denture. They are, in the order of their importance: adhesion, atmospheric pressure, muscular control, leverage and gravity.

Adhesion, we learned in high school, is the attraction of unlike molecules for each other. The denture, first dipped in water to prime the adhesive qualities of the saliva, clings to the mucosa, maintains its own integrity through the factor of cohesion and, in turn, adheres to the intaglio of the base. All other conditions remaining constant, the greater the area covered, the greater the adhesion.

As a potential factor in the retention both of the upper and of the lower, atmospheric pressure is absolutely essential and most important when leverage is brought to bear. In an effort to incise food, the anterior part of the ridge becomes the fulcrum. The base, adhering to the mucosa, with this factor of adhesion functioning to its maximum de-

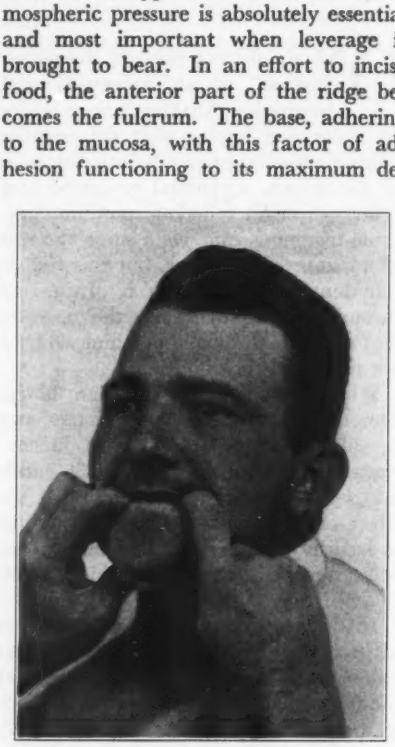

Fig. 2.—Impression reseated on ridge and held in place with thumb and fingers of both hands. The operator attempts to close the jaw while admonishing the patient to "open." The opposite flange is treated likewise.

gree, is retained until pressure is exerted on some incisal area. This pressure, if not directed toward seating the base, tends to break the adhesion. In this section, the particles of air in the saliva are rarefied, and if the ingress of air is prevented by the valvelike action of the tissue around the border, the denture is retained. Here, then, is atmospheric pres-

sure in action, aiding in preventing the denture from being dislodged. This transition from adhesion to atmospheric pressure is of course not attended by any phenomena, nor is the patient conscious of the operation of these physical laws.

Atmospheric pressure may easily be made the primary factor in the retention of a denture, but woe betide the operator! About forty years ago, P. T. Greene and his brother, J. W. Greene, of Chillicothe, Mo., originated a method of securing impressions which they designated as "test impressions," because, even in unfavorable mouths, the impression could not be dislodged by a series of displacing activities, such as coughing, hawking, yawning and grimacing. Modeling compound was employed. A cone of compound was used in the center of an aluminum tray to secure an impression of the palate. The buccal and labial flanges were built up and made thin and the impression was warmed and "muscle-trimmed" and finally postdammed. When the impression was finished, the results were satisfactory, because it clung tenaciously and almost defied removal. The primary factor in retention here was atmospheric pressure. No one uses this technic today who is familiar with the vagaries of modeling compound and the possible untoward results from the use of a thin flexible tray. Dentures constructed on a cast poured into one of these impressions will remain satisfactory from the standpoint of retention until the tissues, in response to the laws of atmospheric pressure, are drawn down into the vacuum, a matter of a week or ten days. I should like to interpolate here that the psychologic factors involved were equally disastrous since they always placed the operator on the defensive. The patient was required to attempt to dislodge the denture. The patient finally won, since he never quit trying.

Fig. 3.—Cross-section of lower impression. Plaster was poured in this area and removed and the impression treated as illustrated in Figure 1. The plaster was returned to this area of the impression to show distention of the lingual flange by the mylohyoid muscle to provide for freedom of its action in the finished denture.

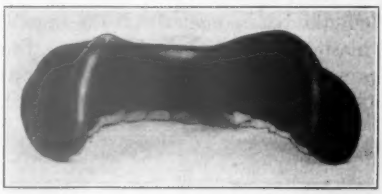

Fig. 4.—Lingual aspect of completed denture. The lingual border is well rounded. The denture did not require subsequent alteration.

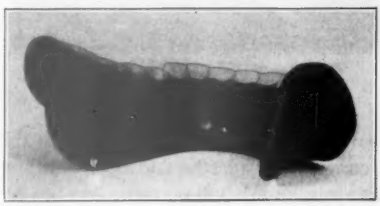

Fig. 5.—Lingual aspect of lower denture, showing depth to which lingual flange may in many instances be satisfactorily extended provided action of mylohyoid muscle is not restricted.

Quite frequently, in various parts of the United States, this temporary retention is rediscovered by some dentist, who

becomes enthusiastic over it, and causes himself much grief that might otherwise have been avoided had he searched dental literature, as his attorney would have searched the patent office records had he discovered (?) a new invention.

About a year ago, Hugh W. MacMillan, of Cincinnati, Ohio, entertained me in his office with an informal discussion of mouth anatomy. Among other bits of information, I learned that the jaw is opened by the action of the mylohyoid muscle, the neck muscles, or platysma group, and gravity. I knew that G. V. Black demonstrated years ago with his gnathodynamometer that the muscles of mastication were capable of exerting a pressure of from 100 to 200 pounds, but did not know until this visit that the greatest "pull" Dr. MacMillan was able to compute in an effort to open the jaws was approximately 8 pounds.

Fig. 6.—Labial view of Figure 5.

When the jaw is opened voluntarily, the mylohyoid muscle is contracted and the distance between its origin and its insertion is shortened, and the lingual flange of any denture that lies in the space reserved for this action either "kicks up" the denture or the tissue encompassing this area becomes sore. Therefore, the lingual border should stand away from osseous structure and be well polished and rounded.

The sublingual tissue in this area is vascular, not tense or muscular, nor particularly sensitive, and appears to be designed as a pocket to hold some of the food until time for deglutition. A portion of this pocket may well be filled with the lingual flange of the denture, provided the flange is given a well-rounded border. It was almost impossible to get the dental student to comply with this admonition until we began to calibrate the flanges with a Boley gage to demonstrate that a thickness of 5 or 6 mm. was essential. This thickness is arbitrarily added to the occlusion model, or bite-rim, when the case is ready to flask. This well-rounded addition, together with the high polish, is essential in preventing irritation in this vascular area.

The technic for making the lower impression follows without variation until it is practically finished; the method used by F. M. Hight, of Houston, Texas.[1] Before this supplement to the technic used by Dr. Hight is described, let me quote a few sentences from this contribution to prosthetic literature and an observation by one of the discussers, B. L. McCoy, now of Galveston, Texas.

Fig. 7.—Aluminum-magnesium metal base worn by public speaker since fall of 1936 without phonetic disturbance or subsequent alteration.

Maintaining retention depends largely on the absence of any pathologic condition and the presence of a smooth, gliding, balanced occlusion.

By maximum retention, I mean that retention which can be obtained in a given case

1. Hight, F. M.: Simple Technic to Obtain Maximum Retention and Stability in Lower Impressions. J.A.D.A., 12:778, July 1925.

without resorting to the compression of tissue. We should not expect to obtain the same degree of retention in the unfavorable case that we obtain in the favorable.

As soon as we realize that the best possible impression can be no other than a counter die of the conditions present, we shall cease to look for something in the way of a miracle that would insure the making of all lower dentures uniformly successful. . . .

The first step is the snap impression. In making this, the operator should avail himself of as great an area as possible, especially in extending it well up on the ramus. . . .

In many instances, the retention at the heels will be insufficient, and compound may be added with a tracing stick to secure better adaptation.

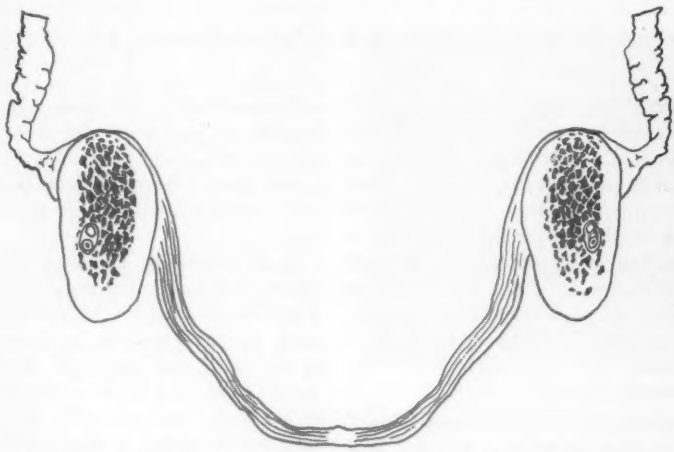

Fig. 8.—Diagram showing attachment of buccinator muscles and mylohyoid muscle to crest of edentulous ridge.

Dr. McCoy, in discussing this paper, says:

I think the essayist has not put sufficient stress on the importance of the extension of the impression in the retromolar triangle area. Failure to secure the maximum retention possible will be, in ninety-five per cent of cases, due to underextension in this area.

Before the lingual borders are trimmed to reduce the bulk so essential to maintain their integrity during the heating operation, the tissue side of one lingual border is heated its entire length by projecting a flame from the burner with a common chip blower. This area includes in depth all of the intaglio or tissue contact surface of the lingual flange from the crest of the ridge to the lowest part of the border and lengthwise from the bicuspid area to the posterior part of the impression. If the opening in the nozzle of the chip blower is tiny, say 20 gage, and the flame slightly yellow, the flame may be directed to any portion of the compound with varying degrees of intensity, and the part successfully softened.

Beginning at the part of the impression approaching the crest of the softened ridge, the heat is applied for an increasing length of time as the border is approached. Finally, a large blast is directed at the entire area, and the impression is dipped in water of a temperature of 130 F., held an instant to chill the superheated compound and placed in the patient's mouth. With the patient's head resting firmly against the headrest, even pressure is exerted over the entire area of the impression with the forefinger and

middle finger of each hand, while the thumbs resist the pressure beneath the jaw. The operator continues to press upward, in an apparent effort to close the mouth, simultaneously urging the patient to "open." In the effort to open, the patient causes the fibers of the mylohyoid muscle to contract and automatically press out or mold the warm compound. The denture constructed from this impression is not lifted from its seat by the action of this muscle.

Providing room for the bulging action of this muscle against the lingual border of the lower denture may be a partial solution of the problem of the "clicks" of conversation.

729 Shukert Building.

SCURVY COMPLICATED BY OSTEOMYELITIS OF THE SYMPHYSIS OF THE MANDIBLE: REPORT OF CASE

By Henry A. Mark, A.B., D.D.S., Jacksonville, Fla.

SCURVY has for centuries plagued the explorer, the wanderer and the physician. Men would embark on some worthy adventure, only to find themselves overtaken by a scourge; and it is to one of these intrepid souls, not a physician, but an explorer, that we owe our thanks for one of the earliest complete descriptions of this affliction. Jacques Cartier, writing of his voyage to the new world during the early part of the sixteenth century, relates:

> The unknown sickness began to spread itself amongst us after the strangest sort that ever was eyther heard of or seene; inasmuch as some did lose all their strength and could not stand on their feete, then did their legges swel, their sinnowes shrinke as blacke as any cole. Others also had their skins spotted with spots of blood of a purple color; then did it ascend up to their ankles, knees, thighs, shoulders, armes, necke: their mouth became stincking, their gummes so rotten, that all the flesh did fall off, even to the roots of the teeth, which did also almost all fall out.[1]

As the time passed, we came to a better understanding of the factors in the production of and the method of cure of scurvy, so that, in most civilized countries, it soon passed from common observation, and is now seldom seen in private practice.

It is surprising to many of us that scurvy has not completely disappeared. True, tremendous strides have been made since Cartier gave his men an infusion of the bark and leaves of the sassafras tree to drink and British sailors took limes to sea with them, but with the tendency of civilized people, living in cities, to eat unbalanced diets of prepared foods, and with many peptic ulcer cases on a regimen of bland well-cooked foods, excluding most if not all vitamins, it is small wonder that, in spite of the availability of a simple prophylactic measure, scurvy still exists. In many of these cases, the patient consults the dentist for relief of bleeding, sore gums, while dismissing joint pains, weakness and muscle aches as exacerbations of a chronic rheumatoid process. It is for these reasons that I feel it is not amiss to review this subject briefly and report a case.

From the Medical and Dental Service of the Kings County Hospital, New York City.

Scurvy is a disorder of nutrition due primarily to the lack of a specific vitamin and characterized by distinctive changes in the bones and by lesions of the blood vessels. These conditions give rise, respectively, to bone tenderness and hemorrhage in various parts of the body. Today, we know that this disease is due primarily to the lack of the water-soluble vitamin C. Neither age nor sex play a part in its etiology. It may develop in the young and vigorous or in the aged and feeble, if the diet is deficient. It is impossible to estimate even approximately the frequency of occurrence of the mild, undeveloped form which is brought about by a partial deficiency in the diet. Other conditions predisposing one to the disease, particularly physical and moral influences, are overcrowding, living in cold damp quarters and prolonged fatigue under depressing influences.

It is an interesting fact that even prolonged starvation does not necessarily cause scurvy. Investigations of Holst and Frolich have taught us the fallacy of regarding fruits and vegetables as entities in respect to their antiscorbutic activity and have demonstrated that they must be evaluated from a quantitative standpoint. A period of deprivation of about six months is necessary before scurvy becomes manifest. The time of its appearance depends on numerous secondary etiologic factors, especially individual susceptibility and the quantity of vitamin previously stored in the body.

The most characteristic oral lesions are those of a marked stomatitis. The gums become turgid, swollen, hypertrophied and spongy, resembling, in severe cases, a fungoid mass of old rose or plum color, which bleeds on touch. The teeth, involved in a generalized parodontitis, become loose and the breath is foul and the tongue large and clumsy. In extreme cases, necrosis of the jaw may occur.

Treatment consists of a high vitamin-C diet, fresh air and sunshine. Cod liver oil and ultraviolet light therapy have proved beneficial. The oral condition should be properly treated.

REPORT OF CASE

H. W., a railroad worker, aged 22, was admitted to the Kings County Hospital May 21, 1934 complaining of "extreme soreness of the mouth" and general malaise. Two weeks before, he first noticed swelling and soreness of the gums, which had grown progressively worse. Two days prior to admission, a swelling developed on his chin, for which he consulted a dentist. His condition failed to respond to treatment and he entered the hospital.

Oral examination revealed a generalized acute stomatitis. The upper jaw contained a full complement of teeth, many of which were carious and broken. Most of them were loose. The interproximal papillae were exceptionally hypertrophied, extending out and between the teeth approximately 5 mm. The tissue was of a bluish plum color. The marginal gingival tissues, at their junction with the necks of the teeth, presented a dark reddish blue line of demarcation, from a narrow band of grayish slough superiorly. Just above this, there was a bulging, puffed, sacklike area of hypertrophy, resembling epulides, and ranging from an old rose to a plum color, which extended to the mucolabial and buccal folds. A similar condition

Fig. 1.—Hypertrophy of interproximal papilla, with marginal gingiva and tissue up to labial fold.

involving the palatal side and overlapping most of the teeth was observed, with bleeding at the touch. The upper lip was pushed superiorly in front to accommodate the bulging gums. The inner surface of the lip presented areas of ecchymotic patches. (Fig. 1.)

The lower jaw presented a more hideous appearance. Here, the pathologic condition involved the gums and anterior teeth as far back as the third molar on both sides with a saclike area of hypertrophy labially, buccally and lingually, concealing almost all of the teeth. In appearance, the condition was similar to that in the upper jaw, though more pronounced. The anterior teeth and first bicuspids on both sides were loose. Yellowish pus oozed from along their roots. The only possible means of retention of the teeth were the heavy tartar accumulations along their roots, acting as a cementing agent. Several of these teeth were carious and broken.

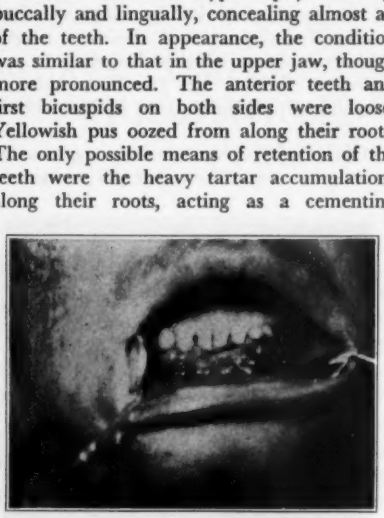

Fig. 2.—Hypertrophied gum tissue bulging labially. The tissue in the left cuspid area has a torn appearance.

At the left cuspid area, the tissue was torn vertically as if a ragged incision had been made. (Fig. 2.) The lower lip bulged outward to accommodate the hypertrophic tissue labially, and its under surface presented ecchymotic patches. The salivary glands were inflamed, indurated and painful on light palpation. *Fetor oris* was marked. The tongue was heavy and clumsy and protruded in the midline. The symphysis of the mandible was swollen and of a bronze color and presented, in its central portion, a circular area of fluctuation measuring approximately 15 by 30 mm. (Fig. 3.) This had begun to spread along the facial planes of the neck. Slight pressure here would cause yellow pus to exude from about the teeth.

The glands of the neck were painful and easily palpable. There was occasional epistaxis, fleeting pains in the leg and costiveness. Smears for Vincent's organisms, blood examination and urinalysis were negative. The blood count was not significant. Unfortunately, a platelet count was not obtained. Other physical findings were negative at this time.

A history taken as to the diet revealed that the patient had no source of vitamin C previous to admission to the hospital. The diet as described consisted of: breakfast, strong coffee or tea, white flour roll or toast; lunch: carbohydrates, e.g., pie, white bread or roll, tea or coffee; dinner: roast, with vegetables boiled with soda and some form of sweet made from white flour.

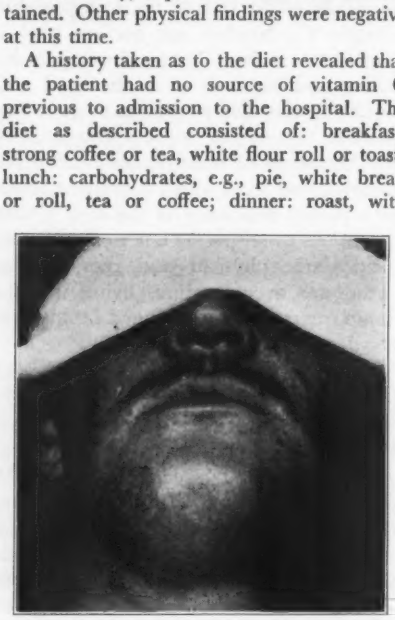

Fig. 3.—Swelling of soft tissues of symphysis.

A high vitamin C diet as follows was instituted the day of admission to the hospital:

Breakfast 7:30 a.m.: Whole orange, lemon juice, one-half grapefruit, cereal with milk and a glass of milk.

9:30 a.m., glass of milk.

Lunch: Whole orange, lemon juice, one-half grapefruit; two vegetables, such as lettuce, cabbage and spinach.

3:00 p.m., glass of milk.

Dinner: Same as lunch.

With this diet and mouth hygiene, the stomatitis rapidly improved. The gum tissues began to take on a normal appearance. The "dietetic test" proved successful and an im-

pression of a scorbutic condition was changed to a diagnosis of scurvy.

Extra-oral and intra-oral roentgenographic examination May 22, the day after admission, revealed no great amount of bone disease of the upper jaw. Intra-oral roentgenograms of the lower six anterior teeth, including the first bicuspids, presented, about the apices, a moth-eaten appearance of the bone, suggesting incipient osteomyelitis. An anteroposterior roentgenogram of this area had not as yet shown deep-seated bone destruction. June 6, further roentgenographic examination showed moderate destruction of the symphysis of the mandible, extending to the lower second bicuspids, with beginning sequestration anteriorly, the largest sequestrum measuring about one-sixteenth inch in length. Under nitrous oxide-oxygen anesthesia, the right lower central and lateral incisors, cuspid and the first bicuspids were removed to secure drainage. An attempt to save these teeth was hopeless. June 10, there was further destruction of the symphysis as formerly described, but extending now to the right and left bicuspid area. A destructive type of osteomyelitis with sequestration was indicated. To secure further drainage, the lower left central and lateral incisors, cuspid and first bicuspids were removed. A bold incision at the most pendent area of fluctuation at the symphysis was made. About 3 ounces of a serosanguinous pus was evacuated. A through-and-through drain of rubber dam was inserted.

The improvement in hospital was rapid on a high vitamin-C diet, with proper oral hygiene and adequate drainage of pus. The patient had a temperature ranging from 101 F. postoperatively to 105 F. and gradually returning to normal. He was discharged from the hospital on June 25, 1934.

SUMMARY

The frequent association of vitamin-C deficiency with a low-grade infection of the gums should encourage the dentist to investigate the diets of those patients who present themselves for "pyorrhea treatments," and who fail to respond to local measures. The recent spread of uncontrolled diet fads has resulted in numerous cases of a mild or latent scurvy.

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THE NUTRITION HISTORY AND ITS RELATION TO DENTAL PROBLEMS*

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IN the course of studies being carried out in the College of Dentistry at the University of California on the relation of diet to dental disorders, an endeavor has been made to secure as accurate a nutrition history as possible from the patient, or from the patient's mother in the case of a child. Since few of us recall many details regarding our food habits before the age of 15 years or so, we have, whenever possible, even in the case of adults, interviewed the patient's mother (personally or by correspondence) regarding these early years.

We were fully aware, before we attempted to take nutrition histories of patients, that the experience of most persons who have endeavored to learn what the food habits are or have been by questioning the individual has been rather disappointing. But we were very anxious to secure such data, and so have attempted to work out a technic which makes possible an estimate of the nutritional background. As a result of this experience, it is believed that, in most instances, it is possible to secure a fairly accurate (in a relative sense, of course) estimate of the present and past nutritional record, provided sufficient time and a moderate amount of tact and diplomacy are used.

However, it is not intended to give the impression that the degree of accuracy of interpretation of results, such as one expects in animal research, is possible. But the data secured during the past three years in more than 500 cases have shown that it is possible to say, in most instances, whether unsatisfactory nutrition may be a factor in the etiology of the disorder which has brought the patient to our attention.

A detailed nutrition study of more than 500 persons suffering from various dental and medical disorders has shown that few of these persons were taking an optimum diet. In many of the cases studied, the reason was not an economic one. But it should never be forgotten that economics and nutrition are closely related. The reason for the unsatisfactory diet appeared to be a lack of understanding that one of the prerequisites for optimum health is the presence in the diet of liberal amounts of all dietary factors. It is fully recognized that a diet may contain adequate (liberal) amounts of all dietary essentials, but owing to the body's inability to assimilate them, malnutrition or even deficiency diseases may result. But it cannot be stressed too often that the mere fact that one is not suffering from a deficiency disease is no indication that his diet is optimum from a nutrition standpoint.

Although we fully appreciate that hereditary factors, developmental defects, poor mouth hygiene, endocrine disturbances, bad general health and lack of professional care often complicate dental problems, we question whether the newer

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knowledge of nutrition is as yet being applied by the majority of persons. We do not believe that optimum nutrition on a large scale over a period of years (except among certain primitive persons) has been given a chance to show what it can do in the prevention of dental disorders. It appears that certain dental problems are primarily inheritance problems over which nutrition has little or no control. An example in point is certain enamel conditions. The possible rôle of nutrition in orthodontic work cannot be discussed at this time, but unquestionably many factors besides nutrition complicate the orthodontist's problems.

That all persons are not capable of attaining the same degree of health (which in turn refers to dental health) is undoubtedly true; in other words, inheritance may, and in many instances does, set a limit to what a person is capable of attaining from a health standpoint.

In the light of the experience gained from taking more than 500 nutrition histories, the series of questions have been formulated that make up part of this paper. No one is more cognizant than I of the fact that the usual answers to questionnaires are frequently of little value; but it is not intended that this set of questions be given to a patient: they are for the guidance of the dentist, the dietitian, the physician or other persons sufficiently trained to take nutrition histories. Naturally, all questions do not apply to all patients. As soon as one is familiar with the many factors which may enter into the nutritional background, the questionnaire can be dispensed with, but until one is familiar with the technic, it serves as a reminder of important points.

Before a history is taken, a patient should be asked to keep a record of all foods eaten for a period of two weeks. There should be no comments about food habits at the time the request is made because what is wanted is as true a picture of the present dietary habits as it is possible to secure. The following is a copy of the instructions given at the time of acceptance of the person for study.

UNIVERSITY OF CALIFORNIA
COLLEGE OF DENTISTRY

Nutrition

Suggestions for recording food eaten

Please keep a record for two weeks (or for as many days up to two weeks as the appointment permits) of all foods eaten (and coffee, tea, cocoa or other fluids taken), *giving the approximate amounts at each meal.*

For example:

Breakfast: Cereal (name kind) with milk (or cream); a cup of black coffee or (with cream and sugar, how much, as the case may be) a cup of cocoa or glass of milk, as the case may be, etc.

Lunch: Two sandwiches (4 slices of white or whole grain bread as the case may be) and (the contents of the sandwiches, as 1 ham, 1 jelly) 2 olives (green or ripe), etc.

Dinner: Serving of meat (beef, lamb, pork, etc.), 2 medium-size potatoes; serving of corn, etc.

Please list the *approximate amount of whatever food is eaten.* Do *not* write down food served unless you ate it.

Please record all candy, milk shakes, ice cream cones, fruit (kind), etc., eaten between meals. Please mention time of meals and also time of taking extra food.

Large size sheets of paper arranged as follows make recording the food eaten very easy.

Both sides of the paper may be used. Use as many sheets as necessary. The more detailed information given regarding the food eaten, the more valuable the record.

Date	Breakfast	Lunch	Dinner	Between meals

This food intake record should be submitted at the time the nutrition history is taken. The menus recorded may or may not be an index of earlier food habits, but they do give the present food practice of the individual. It is advisable not to comment about this record until after the history is taken. The nutrition history is composed of several parts, which will be evidenced by a study of it.

The Nutrition History

Patient No..... Date.....
Name.....Telephone No.....
Address .....Nationality .....
Date of birth.....Language spoken.....
Place of birth.....Height.....Weight.....
Type of body build: Slender.....Normal.....Stocky.....

Part I

The following questions apply to the health of the mother of the patient or to the general health of the family:

1. Where and when was the father of patient born?.....
2. Where and when were you born?.....
3. Did you live on a farm or ranch, in a small village or in a city up to the time of your marriage? Please give details.....
4. What was the state of your health during the ten years before the patient was born? .....If not in good health, please name illness or ilnesses and treatment .....
5. Were you in good health during your pregnancy with the patient?.....
   Amount of nausea: Few months?.....Entire pregnancy?.....
   If very miserable, please make a general statement as to the amount of food retained .....
6. What were your dietary habits: (1) A few years before pregnancy with patient? (2) During pregnancy? (3) While nursing in respect to:
   (If any marked change occurred during pregnancy or lactation, please give details.)
   If foods were used almost daily and in fairly generous amounts, please indicate by XXX; once or twice a week, XX; if only occasionally, X.
   a. Meat .....
   b. Milk .....
   c. Cheese and other milk products.....
   d. Eggs .....
   e. Fish and other sea foods.....
   f. Cereals, kinds.....
   g. Bread (white or whole grain).....
   h. Vegetables, kinds.....
   i. Fruits, kinds.....
   j. Peas, beans, rice.....
   k. Tea or coffee or both.....
7. What is the dental condition of the various members of the family?
   a. Grandparents
      Father's parents.....
      Mother's parents.....
   b. Father .....

c. Mother .....
d. Brothers .....
e. Sisters .....

8. Does the patient have better or poorer teeth than the other members of the family?.....
.....Or are his teeth above the average?.....
9. Is the patient taller or shorter than other members of the family?.....
Height of father..... Mother.....
Weight of father..... Mother.....
Are the heights and weights of parents average for their respective families?
10. Is the body build of patient like or unlike that of other members of the family?.....
11. In general, what is the health (or illness) record of the family?.....
Has any member of the family had tuberculosis, or arthritis or diabetes?.....
Is there a history of allergy in the family: eczema, hay fever, asthma?.....
Is there a history of deafness in the family?.....If so, which members?.....

Part II

Diet and health history up to about 6 years of age

The following questions to be answered, if possible, by the patient's mother, father or near relative: (Note: *You* and *your* refer to *patient* unless otherwise stated).

1. What number child are you in the family? (1st, 2nd, etc.).....
2. How much did you weigh at birth?.....
3. How long a time between you and the previous child?.....
4. How many children are/were there in the family?.....
5. Were you breast fed?.....If so, for how long?.....
6. If not breast fed, what type of formula were you given?.....
7. At what age were foods such as orange juice, tomato juice, eggs, cod liver oil, cereals (kinds), meat, vegetables added to your diet?.....
In other words, please give as much information about foods given (and amounts) during the first two years as it is possible to recall.
8. Were you a difficult feeding problem at any time up to the age of 2 years?.....
If so, why?.....
Between the ages of 2 and 6 years?.....
If so, why?.....
9. Did you have a good appetite up to the age of 2?.....
Up to the age of 6?.....If not, why?.....
10. Did you have any illness or illnesses up to the age of 2 which interfered with food consumption?.....Up to the age of 6 years?.....If so, please give details.....
11. Did you take cod liver oil or a similar preparation up to the age of 2 years?.....
Up to the age of 6 years?.....
12. Were you given sunbaths as a baby?.....Up to the age of 6?.....

Please give as much information about dietary habits, including consumption of candy (or other sweet foods, such as jams, jellies, cookies and sweet cakes), milk, eggs, meats, cereals, breads, fruits and vegetables up to the age of 6, as it is possible to recall.

Did the family live on a farm, on a ranch or in a small village where it was possible to have a garden, chickens and/or a cow during the first 6 years of your life? In other words, was food available which did not cost "visible" money? Or did the family live in a city where all foodstuffs had to be purchased?.....

Part III

Dietary habits between the ages of 6 and 15; from about 15 to the present time (ages relative, of course).

What has been the trend in the dietary habits of the patient in regard to the following foods:

If used almost daily in fairly generous amounts, please mark XXX; once or twice a week, XX, and if only occasionally, X. (Adult patients usually know what their dietary habits were after about the age of 12; not details of menus, of course, but they know what their nutrition set-up was. That is, they know whether they lived on a farm, a ranch or in a village and whether they had a garden, cow and chickens or whether the family has always lived in a city.)

Food	Ages 6 to 15	Ages 15 to 25	Age 25 to present time
A. Fruits:			
1. Apples			
2. Bananas			
3. Oranges			
4. Grapefruit			
5. Lemons			
6. Pineapple			
7. Seasonal fruits: berries, melons			
B. Cereals:			
1. Bread, white or whole grain, av. no. slices per day			
2. Breakfast cereals (favorites)			
a.			
b.			
c.			
Are you or were you especially fond of dark breads and whole grain cereals?			
3. Rice (brown or white			
4. Cornmeal (white or yellow)			
5. Macaroni or spaghetti			
C. Meats, eggs and sea foods:			
1. Meats of all kinds			
2. Fish (name kinds)			
3. Other sea foods			
4. Eggs			
Are you fond of eggs as eggs? Or have you taken them mostly in foods such as cakes, puddings, etc?			
D. Milk and its products:			
1. Fresh milk			
2. Cocoa and other milk drinks			
3. Cafe au lait			
4. Buttermilk			
5. Butter			
6. Ice cream			
7. Cheese			
8. Cottage cheese			
9. Milk puddings			
10. Creamed soups			
Did you ever drink soured milks such as acidophilus milk and kumiss?			
If so, when and for how long?			
E. Other fats:			
1. Oleomargarine			
2. Olive oil			
3. Other oils, such as cottonseed			
Was much fat used in cooking or for salad dressings?			
Are or were you fond of fat rich foods?			

F. Vegetables and legumes:
1. Leafy:
a. Greens, such as..... ....
watercress ....
lettuce ....
spinach ....
cabbage ....
2. Roots and tubers:
a. Potatoes ....
b. Carrots ....
3. Tomatoes ....
Tomato juice..... ....
What other vegetables were used freely?.....
Are or were you especially fond of raw vegetable salads, such as green salads, carrots (raw), cabbage (raw), tomatoes, green peppers, watercress and endive?.....
4. Legumes:
a. Navy or other beans..... ....
b. Peas ....
5. Nuts, including peanuts..... ....
Has your diet for the past ten to fifteen years (depending on age of patient) contained in general more vegetables and fruits than it has meat, milk, eggs and cheese?.....

G. Sweet foods:
1. Sugar ....
2. Candy ....
3. Cakes, cookies..... ....
4. Doughnuts, snails..... ....
5. Jams, jellies or honey..... ....
6. Gum ....

Aside from the rating given above, do you consider that your intake of the above-mentioned sweet foods has been higher than what is termed average?.....
Are you especially fond of the "life-saver" type of candy?.....
the "chews"?.....chocolate creams?.....gum drops?.....
Please give as much information about your consumption of sweet foods, past and present, as it is possible to recall.
Have you, or have you had in the past, any pronounced dislikes among foods?.....
If so, please name the foods.....
Do you dislike these foods at the present time?.....
Are the menus submitted typical of your food habits for the past ten to fifteen years (depending on age of patient)?.....If not, what have been the most outstanding changes made? .....
It is often found that a person has two, three or more periods from a dietary standpoint in his life, depending in part on his age. The more time spent, within reason, discussing food habits with a person, the greater will be the understanding of the possible rôle of nutrition in the dental problem presented.

Part IV

Some health, heredity and hygiene factors which may or may not complicate the dental, medical and nutrition program.

1. Are there any dental anomalies in the family, such as missing teeth or enamel defects? .....
2. Have you heard the family comment that your gums were especially sore while cutting the temporary or permanent teeth?.....
3. Have you ever had trouble with bleeding gums?.....If so, when.....

4. Did you suck your thumb as a child?.....If so, between what ages?.....
5. Did you have any other habits such as lip sucking, tongue sucking or posture habits such as resting chin on the hand?.....
   Please give as much detail regarding these habits as possible.....
6. Have you had orthodontic work done?.....If so, between what ages?.....
   Have the teeth remained where they were placed?.....
7. Were you the only child in the family who needed to have orthodontic work done?.....
8. What did the orthodontist say may have been the primary cause for the dental condition? .....Inheritance? .....Habits? .....
   Loss of teeth?.....Missing teeth, etc?.....
9. Did your first teeth decay rapidly?.....
10. Between what ages did you have a rapid period of growth?.....
11. Between what ages did you have most decay in the permanent teeth?.....
12. Have you visited your dentist at regular intervals for the past ten to fifteen years (depending on age of patient)?.....
13. Does your dentist say that your mouth gives evidence of good mouth hygiene?.....
14. Please check the illnesses you have had in the following table:

Disease	Age	Disease	Age	
Chickenpox		Pneumonia		Were you subject to colds
Mastoiditis		Rickets		as a child?.....
Measles		Scarletfever		As an adult?.....
Mumps		Whoopingcough		

Were you seriously ill with any of the above-mentioned illnesses?.....
If so, please state for how long, and other details of interest.....

15. If you have had illnesses other than those listed in the foregoing table, please mention them .....
16. Did they interfere with food consumption for several months?.....
    Were you placed on a special diet?.....If so, please give details .....
17. Have you been chronically tired for years?.....If so, to what do you attribute it?.....
18. Are you or have you been under emotional strain for several years?.....
19. Are you inclined to worry?.....
20. In general, what has been the state of your health for the past ten to fifteen years?.....
    .....

Please mention any other items of interest pertaining to health or dietary matters not included in the foregoing questions.

Possibly some of you are asking yourselves the following questions:

1. Of what value to me as a dentist is the nutrition history? Is it practical?

2. Of what interest to me is the childhood history regardless of whether the patient is a child or an adult?

3. Will patients be sufficiently honest about their dietary habits to make this information of value?

4. What is to be learned from a study of the food intake record?

As previously stated, it is fully recognized that there are factors other than diet in dental disorders, such as heredity, lack of mouth hygiene and of professional care, endocrine imbalance, poor general health, systemic disorders and developmental defects. But it would appear that if a dentist knew the nutritional back-

ground of his patients as well as their illness and health records, he would unquestionably have a better understanding of why certain patients did not respond to treatment which had proved satisfactory for other patients. In other words, whether the dental attention needed is operative dentistry, orthodontics or restorations, and the finished work is not the success that it was hoped it would be, from a practical standpoint, could not the question at times be asked, "Was the patient in the last analysis ever a good dental risk?" In certain instances, has not the dentist been accused of doing poor work when, in reality, he has done his best, but the patient was exceedingly poor material on which to work?

If a patient is a child from 10 to 15 years of age, it is amazing how many details the mother will recall of its childhood. Especially is this true if the child had a long series of illnesses and became a feeding problem. Owing to the fact that more information has become available regarding the essentials of an adequate diet, children born since 1925 may or may not have had a better diet than children born prior to this time. We have numerous instances in our records of unsatisfactory diet due in part to economic conditions.

Not infrequently, a person has two or more periods in his life from a dietary standpoint. For example, he may have been born on a ranch or farm and lived there the first fifteen years of his life. Milk, eggs, butter, meat, fruits and vegetables were abundant; he liked these foods and ate liberal amounts of them. He was outdoors a great deal, especially in summer, so sunshine played its rôle as a source of vitamin D. No severe illnesses complicated his childhood. From the age of 15 to 40, he has lived in a city with an entirely different set of conditions as regards his food supply and outdoor life.

Another person may have had an entirely different childhood even though he did live on a farm. He may have had a long serious illness which not only complicated his nutrition problem, but also kept him from leading the active outdoor life of a country child.

Another patient may be one of a family of six or more children who has always lived in a city. All foodstuffs had to be purchased. The income was a moderate one, so, owing to the expense, milk, butter, cheese, eggs, meats and fresh or canned vegetables had to be used in rather limited amounts, cereals and their products, less expensive foods, being used in greater abundance. If a patient recalls that, from an early age, he has taken either tea or coffee or both, one is fairly safe in estimating that less milk has been consumed than is believed necessary for a child. In many instances, all that is necessary is to secure what we have termed "the nutrition set-up" of a family and, with a moderate amount of experience, one can estimate with a fair degree of accuracy (as human studies go) what the food supply has consisted of.

Are patients honest when questioned about their food habits? Several dentists and physicians have asked me this question. From my experience with more than 500 persons during the past three years, I believe the statement is warranted that persons do not intend to falsify their nutrition history or their food intake record. However, the patient may tell you what he really thinks his food habits are or what he intends them to be; but, when confronted with his two-weeks food intake record and questioned closely but tactfully, it becomes apparent to him that he has confused what *he would like to do with what he has done.* For example, a person may tell you during the course of the nutrition history that he is very fond of fresh fruits and fresh vegetables, and he is especially fond of orange juice or tomato juice. His menus show a coffee and doughnuts or coffee and snail breakfast approximately six mornings a week. A small glass (4 ounces) of orange juice is taken on Sunday morning. The menus

may or may not show other foods which are good sources of vitamin C. The end-result may be that the diet is low in vitamin C, even though the patient is really fond of vitamin C rich foods. Convenience and habit are two factors which have to be taken into consideration in nutrition work.

A person may say that he is very fond of milk, meat, eggs and cheese, but the two weeks' food record shows no eggs served as eggs, and few foods served containing them; no cheese; not more than one glass of milk every two or three days; fresh fruits and vegetables only a few times, and meat and fish served only once daily, and apparently in only a moderate amount. However, the menus show a considerable amount of bread, buns, snails, coffee cake, jams, jellies, cakes, cooked vegetables, stewed fruits and coffee and a considerable amount of candy between meals. From such a food record, could it be said that the present dietary was adequate in calcium, phosphorus, protein and vitamins, among other things? Unquestionably, no. The patient did not intend to falsify his history when he stated that he liked milk, meat, eggs and cheese, but, possibly owing to the expense, he could not afford to include them liberally in his diet.

The statement that all persons sat at the same table and so must have eaten the same diet has long been known not to be necessarily true; in fact, it is probably seldom true. A difference in the amounts of the various foods eaten and in likes and dislikes must be taken into consideration. But with sufficient time, patience and tact, it is believed that it is possible to learn what, approximately, a child's or adult's food habits have been.

Before giving a summary of dietary requirements, it should be stated that there is no one food indispensable in nutrition. The dietary factors in a certain food may be indispensable, but all dietary essentials may be secured in a number of ways, as human experience has shown. In our system of diet, milk and cheese are the calcium-rich foods, but this is not necessarily true of other systems of diet. Time does not permit a discussion of racial or regional food habits. The diet of the Eskimo is very different from the diet of the South Sea Islander, and both in turn are different from our diet. When a child or an adult, using our system of diet, does not include milk or cheese or dishes made from them in his menus, the calcium content of his diet is probably below that believed necessary for optimum well-being; for rarely is he securing calcium from foods, for example, which supply this element to the Eskimo or the South Sea Islander.

Milk may be taken in its various forms or used in cooking; it does not need to be taken as a beverage. Meat, eggs, cheese, milk, peas, beans and nuts contain, among other things, protein and phosphorus. These are our protein-phosphorus rich foods. Many foods, such as cereals, breads, fruits and vegetables, add small amounts of calcium, phosphorus and protein to the diet, but they are not considered excellent sources of these dietary factors. Almonds and cauliflower are two foods which may add considerable calcium, among other things, to the diet; but, as a rule, these foods are not eaten in amounts sufficient to replace milk products. Time and space do not permit discussion of foods rich in the various vitamins.

From a practical standpoint, if a child's diet is built around the following foods, the various dietary essentials will be present. The same holds true for the adult diet, but many adults would probably prefer to eat more cheese and take not more than one to two glasses of milk a day. The total number of calories should be increased according to need. It is suggested that it be increased by the use of additional butter, salad dressings, gravies and the foods which go with these fat-rich foods, and additional fruits, such as bananas and apples, instead of by increas-

ing sweet foods. When the likes and dislikes and food habits are known, it is usually not difficult to adjust the diet so that it contains liberal amounts of all dietary factors. The more closely the suggested diet simulates his present food habits, the more likely is the individual to adhere to it. Man has been defined as "a bundle of habits."

The following list of foods may be termed a basal or foundation diet. (Other foods to make interesting and appetizing meals should, of course, be served.)

1 pint of milk (more for children, but perhaps less for adults provided cheese or other milk products are served).

1 egg or more.

1 serving of meat or fish, and in addition another protein dish, such as left-over meat, cheese, peas or beans, macaroni and cheese, creamed tuna and salmon loaf.

1 (8 ounce) glass of orange juice or tomato juice (undiluted). However, if other fruits and vegetables, such as apples, bananas, grapefruit, lemons, pineapple (fresh or canned); lettuce, tomatoes (fresh or canned), cabbage and carrots are available and used regularly, it is not necessary to buy oranges or tomato juice.

1 serving of whole grain cereal at least four times a week for those who like it. For those who do not, whole grain breads, wheat germ, yeast tablets or other sources of vitamin B are available.

2 servings of vegetables, aside from potatoes; preferably green and yellow ones. Fruits which are usually more expensive than vegetables may be substituted in part for them. That is, if a child (or adult) likes fruits better than certain vegetables, let fruits in part be substituted for vegetables, unless cost is the first consideration.

1 to 2 teaspoonfuls of high potency cod liver oil or its equivalent in vitamin D. This also supplies additional vitamin A. There are mixtures of fish oils on the market which may replace cod liver oil. Only a few drops a day is necessary. There are also capsules and tablets which may take the place of the oil. If cod liver oil or another preparation is taken just before retiring, there is no "repeating" during the next day. "Repeating" is often an objectionable feature of fish oil preparations if taken directly after meals.

If a child or adult is so situated that an abundance of sunshine is available, or is fond of fish, such as tuna, salmon or sardines and these are eaten frequently, it would not be necessary to increase the vitamin D content of the diet.

It should aways be remembered that there is no one food indispensable in the diet. What a certain food contains may be indispensable, but all dietary factors may be secured in a number of ways, as human experience has shown. In other words, there is no one system of diet, or list of foods which must serve all members of the human race.

The suggested outline may be expressed in a day's menu as shown in the accompanying tabulation.

The menu outlined may appear to contain more food than an average child would want. It will be noted that the amount of bread suggested is not at all excessive. If some of the foods suggested are omitted and two to three slices of bread are taken at each meal, the diet may contain as much bulk, but may be of lower nutritive value. A child of small body build may not need and probably would not want as much food as is suggested, but a rapidly growing boy or girl with a large frame could easily consume the amounts listed.

This menu is entirely suitable for an adult, but the average adult would probably not want three glasses of milk a day. One glass of milk with additional cheese with the type of foods served would amply take care of an adult's calcium requirement, this depending, of course, in part on what his previous intake of calcium-rich foods had been.

It is a mistake to stress the importance of calcium and neglect to mention the importance of phosphorus. It has been recognized since 1922 that calcium, phosphorus and vitamin D are at least three of the factors concerned in calcification,

but, as Dr. Gamble has so aptly stated, "The charm of euphony is so great, however, that the slogan 'Calcium for calcification' will long be heard."

Details of handling nutrition problems cannot be given at this time. But with the protein, fat, carbohydrate, calcium, phosphorus and iron listed for each of the three meals of the sample menu given, it should not be difficult to decide whether a patient is taking a very unsatisfactory diet. For routine dietary work, detailed calculations are not at all necessary; in fact, they are quite unnecessary. Few persons could keep a sufficiently accurate record of their food intake without special instructions and also special food scales, so why attempt to give accuracy, namely, detailed calculations, to obviously inaccurate data? It must always be remembered that tables of food values are only averages, and that a high degree of accuracy even under the most rigid of hospital conditions is impossible, owing to variations in different samples of food.

It should be emphasized that even though compounds of calcium and phosphorus, such as dicalcium phosphate wafers or blocks, are helpful in increasing the total intake of these two dietary essen-

SUGGESTED DAY'S MENU

Breakfast		Luncheon		Dinner	
Grapefruit		Cream of tomato soup		Meat balls	
Whole grain cereal + cream		2 saltines		Mashed potatoes	
1 egg		Pineapple and cottage cheese salad (2 heaping tablespoonfuls)		Carrots—buttered	
1 slice whole grain toast				1 slice whole grain bread	
1 square butter		1 slice whole grain bread		2 squares butter	
1 (8 ounce) glass milk		1 square butter		Raw vegetable salad, French Dressing	
		1 glass milk		Chocolate pudding + cream	
				1 glass milk	
Protein	24 gm.	Protein	34 gm.	Protein	40 gm.
Fat	36 gm.	Fat	35 gm.	Fat	66 gm.
Carbohydrate	56 gm.	Carbohydrate	56 gm.	Carbohydrate	87 gm.
Calories	626	Calories	661	Calories	1,101
Calcium	0.425 gm.	Calcium	0.467 gm.	Calcium	0.596 gm.
Phosphorus	0.517 gm.	Phosphorus	0.396 gm.	Phosphorus	0.811 mg.
Iron	3.58 mg.	Iron	2.060 mg.	Iron	8.840 mg.
Total for the day:		Protein	98 gm.	Calcium	1.49 gm.
		Fat	136 gm.	Phosphorus	1.73 gm.
		Carbohydrate	199 gm.	Iron	14.48 mg.
		Total calories	2,388		

Food*	Protein Gm.	Fat Gm.	Carbohydrate Gm.	Calories	Calcium Gm.	Phosphorus Gm.	Iron Mg.
1 (8 ounce) glass milk	8	10	12	166	0.288	0.223	0.58
1 slice whole grain bread	3		16	77	0.015	0.065	0.7
1 square butter		8.5		77			
1 tablespoonful mayonnaise	0.2	11	0.4	103			
1 tablespoonful honey			16	65			0.23
1 tablespoonful peanut butter	5	7	3	97	0.013	0.072	0.4
1 piece American full cream cheese	6	7	0.8	90	0.18	0.13	0.27

*Examples of how the dietary factors in a menu may be increased or decreased without changing the character of the menu to any great extent.

tials, they should not be looked on as a panacea in calcium and phosphorus problems. These products add only calcium and phosphorus (unless they contain additional vitamin D); whereas the calcium and phosphorus rich foods, namely, milk, cheese, meat and eggs, add not only these essential minerals, but also needed protein, among other things. It will be seen from the menu suggested that it is not difficult to secure from foods adequate amounts of calcium and phosphorus if menus are planned with an understanding of food values. Undoubtedly, there is a place for these dicalcium phosphate wafers, or blocks, in dentistry and in medicine, but they should be used with an understanding of what they do not supply as well as for what they do supply.

I recognize that to discuss dietary problems with patients presupposes an understanding of the fundamentals of nutrition, but a practical working knowledge of this subject is not difficult to secure. One of the most readable books on practical nutrition is "Nutrition and Physical Fitness," by L. Jean Bogert. It contains a wealth of information.

CONCLUSION

I am fully aware that many conditions complicate the work of the dentist. However, if he knew that all of his patients had had in the past and were now taking a highly satisfactory diet, he would have one less variable to consider in his work. It is believed that the nutrition history will give the dentist a better understanding of the health and the diet of his patients. This applies not only to those who are interested in children's dentistry, including orthodontists, but also to those who practice the other branches of dentistry.

DISCUSSION

Waite A. Cotton, New York City: It is most desirable in nutritional research to learn the food habits of the patient as far back as possible, to observe whether and when the food intake has been changed and whether that change has resulted in any marked difference in the oral cavity. The method outlined by Dr. Simmonds is complete and this knowledge of early diet should be of great value in determining what diets will or will not assure well-formed and well-calcified teeth.

I am not in accord with the theory that, after calcification and eruption, deficiencies of any one or more of the food factors have any direct bearing on dental caries. If they did, all persons having a deficient diet, including those who are starving, would experience dental decay as a result of that deficiency. We know that this does not necessarily follow; for we have perfect teeth in many cases of rickets and other deficiency diseases. We do not find decay starting in the mouths of those who go on a week's or a month's fast. As a matter of fact, their teeth are in better condition at the end of the fast. Those who die of starvation in India and China do not suffer from decaying teeth during the starving period.

I note that an examination of 500 persons suffering from some form of dental or medical disorder revealed that few had an optimum diet. It might be enlightening to examine 500 more persons who were not suffering from any dental or medical disorder and to determine how many of these diets were deficient according to our optimum standard.

We know that an individual may receive liberal amounts of all food factors and still suffer from a deficiency disease. We also see persons who do not receive sufficient amounts of the various food factors and who do not suffer from deficiency diseases. It seems to me that we are getting only a corner view of the subject instead of looking at both sides.

There is no question that all persons are not capable of attaining the same de-

gree of health. Heredity is an important factor in health, but when we can determine what the hereditary weaknesses are, these weaknesses can be overcome very largely by right living, and that is the basis for the treatment of dental decay, as I understand it.

Dr. Simmonds asks of what value the nutritional history is to the dentist, and whether history taking is practicable. That is a very pertinent question, and although I doubt that for most dentists taking such a history is practicable, it certainly would be most useful if by so doing he could determine which cases would be poor dental risks. He would be equipped to render better service to these patients and with less chance of injury to his reputation.

I am not wholly in accord with the diet outline as given. I agree with Dr. Simmonds that it may be too much food for most of us. It has been said that on the average food intake "The patient lives on one third and the doctors live on the two other thirds," meaning that most people partake too freely of the deficient foods when lesser amounts of the natural foods would be better.

The impression I get from the paper as a whole is that deficiencies in the diet are the leading causes of dental decay. I do not agree with this view, for we have charted the diets of 366 children (living average lives in average homes) over a period of years and we have found that children with diets adequate in all factors are not free from dental decay. In fact, some of these children have a high caries index. On the average, we have a higher caries index in those children whose diets are from low to deficient. We also have children in this group with perfect teeth, which would lead me to believe that adequacy or inadequacy has little influence on decay beyond the point of improving the whole body metabolism, and with the metabolic rate increased, the teeth would naturally show less decay.

I am far from being convinced that food as food, or the dietary factors as scientifically applied, has any direct bearing on immunity. The human body, as well as the teeth, was developed on natural foods, eaten in a natural way, and it seems that the most rational procedure would be to partake of simple meals, satisfying the appetite for the moment with one or two foods. Where we *do* need a diet containing all the food factors necessary to life, it is a mistake to include all of these factors at each meal. Rather, they should be obtained in a series of meals. Each meal should be made up of one class of food. Our forefathers ate simply and they developed and kept excellent teeth.

Each food requires a definite digestive treatment, and whereas the sight, smell or thought of food starts the flow of the digestive juices, it requires the actual contact of the food in the digestive tract to determine the strength and quality of the juices needed for that particular food.

To put a chameleon on a Scotch plaid is rather a strain on the chameleon, so putting all classes of foods in the digestive tract at the same time is also a strain on the digestive glands, and one which, over a period of time, weakens these glands.

I am of the opinion that selective eating of natural foods at simple meals, balancing the body requirement over a period of from twenty-four to seventy-two hours, will do more to prevent dental disease than any other method followed up to the present time. Civilization has always stepped backward in health when the people become prosperous enough to afford a variety of foods at the same meal, for that is not Nature's way.

CLINICAL APPROACH TO THE PROBLEM OF PULP CANAL THERAPY*

By Morris B. Auerbach, D.D.S., Brooklyn, N. Y.

THE basic problem of the conservative treatment of the pulpless tooth may be stated as follows: Is it possible to carry out root therapy and keep the tooth and surrounding tissues in a non-pathologic condition? If so, what technic will best achieve this result? The problem appears to resolve itself into two parts, the relation of which at first seems puzzling.

It is hoped, however, to make clear the contention that the first of these questions (relating to the periapical tissues) cannot be answered without due consideration to the second (relating to the technic).

We cannot denounce or condone root therapy except on the basis of a technic that gives reasonably good and uniform clinical results. In the past, too many attempts have been made to consider the results without mentioning anything about the methods.

There are four methods of scientifically evaluating the efficiency of a root-canal-therapy technic: (1) clinical, (2) roentgenographic, (3) bacteriologic and (4) histologic.

Although these are the accepted criteria for evaluating the results of pulp-canal therapy, we recognize their inadequacy. At the same time, we will all agree that, from a purely scientific point of view, bacteriologic and histologic studies of treated teeth should be the best criteria. However, the effectiveness of these methods is considerably weakened by the heretofore unsolved problem of collecting pure cultures and the difficulty of acquiring sufficient material. Besides these weaknesses, there is the additional thought that bacteriologic and histologic studies must be based on a standardized technic of root-canal therapy that has proved its value. The only way to prove this value in the beginning is by clinical and roentgenographic evidence. If our technic will pass two of these four tests, we can safely use it as a basis for verifying the other two and thus answer the entire question.

Many dentists are of the opinion that all treated teeth are a menace to health and so should be extracted. This opinion has been based in a large majority of cases upon bacteriologic studies of the teeth. There exists a great deal of evidence that bacteriologic findings present a high percentage of error. The cultivation of organisms from live pulps of normal, x-ray negative teeth and the lack of correlation between bacteriologic, histologic and pathologic pictures, as pointed out by Hatton and others, indicate that we should hesitate before basing conclusions on this type of study. To date, no method has been devised to secure a culture from the apex of a tooth without contamination by oral tissues and oral fluids.

The difficulty of collecting material likewise lessens considerably the possibility of drawing sound conclusions from histologic and bacteriologic evidence. Many such studies have heretofore been confined to doubtful material. Conspicuous among these have been studies based upon hopeless failures—cases which often should not have been attempted in the first place. Patients cannot be expected

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to part with teeth that are clinically comfortable and are giving them suitable service, especially after they have sacrificed the time necessary for pulp removal and root-canal filling. Another type of study which, in my opinion, has little value is that of isolated cases—selected cases which cannot teach us anything since findings must be based on a large number of cases and a uniform technic of root-canal treatment.

Referring to the bacteriologic method of attacking the problem of root-canal therapy, J. R. Blayney[1] says:

> It is obvious from a study of these reports that little or no attention has been paid to the manner in which the tooth was treated or the length of time that has elapsed since the tooth was treated. Pulp-canal therapy has been passing through a radical change, and it cannot be condemned on the evidence gathered from cases improperly treated.

Any study of the root-canal problem, whether bacteriologic, histologic, clinical, or roentgenographic, must be made on all the treated teeth of an unselected group and not confined to teeth which are from time to time ordered extracted because of failure in treatment or of disease or to make way for prosthesis. Moreover, such a study will have no value unless the root-therapy technic employed has been modernized, standardized and proved sound. This at least removes one variable in this vast picture composed of so many variables. Thus we come to the conclusion that only after developing a technic that gives clinical and roentgenographic evidence of being practical and successful can one even consider other methods of investigation.

Many papers have been written on the subject of root-canal therapy in recent years. Most of these have been confined to discussions of technic, especially methods of filling canals. These articles usually show roentgenograms of a few highly successful cases, which may or may not be representative of all the cases treated.

TABLE 1.—ALL CASES TREATED, 1934-1935

	Vital			Non-Vital		
	Upper	Lower	Total	Upper	Lower	Total
Central incisors	98	3	101	159	12	171
Lateral incisors	91	9	100	72	4	76
Cuspids	62	6	68	37	5	42
First bicuspids	107	32	139	11	4	15
Second bicuspids	119	61	180	12	9	21
First molars	7	8	15			
Second molars		4	4			
Total	484	123	607	291	34	325

Vital canals 718
Non-vital canals 337

Statistical studies of large groups of unselected cases are rare. Maurice Buchbinder[2] says: "Very few papers in the great wealth of material in the past have taken into account the numerical aspect and so while many different technics are available, little light has been shed on what results may be expected from root-canal treatment."

We are here presenting figures obtained from a clinical and roentgenographic study of all the cases treated in the root therapy clinic of New York University, College of Dentistry, during the year 1934-1935. All these cases were treated by

senior students, under the supervision of members of the department. Before studying the figures, it might be well to consider in brief outline the salient points of the technic employed throughout.

The department of pulp canal therapy at New York University conducts its clinic in an infirmary of fifteen chairs set apart from all other clinics in the school building. A registered nurse is in attendance to supervise sterilization and the maintenance of hospital asepsis. At least two members of the teaching staff are present at all times to guide the students as they work on the patients. The instructors are especially trained in root therapy and do not teach any other subject.

TABLE 2.—CASES CHECKED

	No. Treated	No. Checked	Per Cent	Failures	Per Cent
Vital	607	133	22.0	1	0.75
Non-vital x-ray positive	167	47	28.0	4	8.5
Non-vital x-ray negative	158	31	20.0	2	6.4
Total	932	211	22.6	7	3.3

TABLE 3.—ROENTGENOGRAPHICALLY POSITIVE NON-VITAL CASES

	No. Treated	No. Checked	Per Cent	Areas Cleared Completely	Per Cent
Apicoectomy	60	20	43.0	21	
No apicoectomy	107	21	19.5	18	
Total	167	47	28.0	39	83

TECHNIC

Classification of Cases.—The cases are classified as follows: 1. Vital cases (at the time of beginning treatment). 2. Non-vital cases: (a) x-ray positive and (b) x-ray negative. All cases are examined clinically and roentgenographically and classified before any treatment is instituted.

Asepsis.—A strict chain of asepsis is maintained at all times. Large instruments, such as mirrors and explorers, are sterilized in boiling water. Root canal files, broaches, etc., are autoclaved in an instrument case, one of which is in the possession of each student. During the course of a treatment, all instruments are cleaned and then resterilized in a germicidal solution containing formaldehyde. All gauze supplies such as cotton pellets, cotton points and gauze packs, are autoclaved.

Selection of Cases.—A high standard is set and maintained for accepting cases for root-canal treatment. Such factors as the health of the patient, accessibility of the tooth and the structure of the root canals are given close consideration.

Dressing and Seals.—Eugenol is used as an antiseptic and sedative dressing in vital cases and formocresol is used in non-vital cases. All teeth are sealed between visits with a double seal of base-plate gutta-percha.

Ionization.—All canals are sterilized by means of ionization prior to filling. Vital cases are ionized with (Lugol's) compound solution of iodine for a period of fifteen minutes. Non-vital cases are ionized with

the same medicament for two periods of fifteen minutes each.

Filling.—The canals are filled with gutta-percha and chlora-percha, the latter being made fresh for each filling operation. We attempt to fill to the apex with the aid of a measurement made from a roentgenogram taken with a measurement wire in the canal. However, we favor slight overfilling rather than underfilling.

Case Histories.—Complete case histories are kept of each tooth treated. At six-month intervals, the patients are recalled and the treated teeth are examined clinically and roentgenographically.

In Table 1, all the teeth treated by the students during the academic year 1934-1935 have been tabulated. It will be noted that we treated few vital molars. This is not due to any theory on our part that vital molars are poor risks for pulp-canal therapy. On the contrary, with all other factors favorable, a vital molar may be treated very successfully. However, we believe that by confining the attention of the students to incisors, cuspids and bicuspids, they will more readily learn the fundamentals of pulp-canal therapy.

Likewise, Table 1 discloses that we treated very few non-vital bicuspids and no non-vital molars. We are of the opinion that non-vital posterior teeth are poor subjects for pulp-canal therapy. The narrowness of the canals and the presence of accessory canals and multiple foramina make it almost impossible to clean the canals to the apex and obtain adequate drainage.

During the year 1934-1935, the students completed treatment of 607 vital teeth and 325 non-vital teeth, a total of 932 teeth for that year.

In Table 2 are tabulated the results of the recall and reexamination of the 932 treated teeth over periods ranging from six months to three years. Each patient received a card asking him to return to the clinic for recheck. The 325 non-vital teeth are here further classified into x-ray positive (167 teeth) and x-ray negative (158 teeth). Of the treated teeth (932), patients having 211, or 22.6 per cent, returned in response to our recall. Of these 211 teeth, seven had to be extracted, the percentage failure thus being 3.3.

In Table 3, the 167 x-ray positive non-vital cases have been classified according to whether surgical intervention (apicoectomy) was instituted. Of the forty-seven teeth that were rechecked in this group, thirty-nine, or 83 per cent, of the total have been restored to a periapically normal condition as determined by x-ray examination.

CONCLUSIONS

1. Reliable studies of treated teeth can be made only on a large group of cases treated with a uniform well-founded technic.

2. Such a technic can be based on clinical and roentgenographic studies of all the cases treated.

3. In the statistical study presented of all the cases treated at New York University during the academic year 1934-1935, all the treatments were carried out by students, under the supervision of members of the department of pulp canal therapy.

4. These figures are based on recall of patients after periods ranging from six months to three years.

5. If these figures tend to prove that the technic employed will give uniformly successful results as determined clinically and roentgenographically, we can proceed to other methods of investigating the problem of pulp canal therapy.

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ORAL MANIFESTATIONS OF SYSTEMIC DISEASES

By JOHN A. MARSHALL, Ph.D., D.D.S., and S. P. LUCIA, M.D., San Francisco, Calif.

IT is necessary that the significance of lesions of the oral cavity in the diagnosis of many systemic and infectious diseases be brought to the attention of the dentist as well as the physician. Indeed, by careful presentation of available clinical data, the significance of lesions of the teeth, oral mucosa and submucosa can be demonstrated to the dentist, internist, pediatrician, dermatologist and other specialists in the medical sciences. The physician sees the oral manifestations of disease from a point of view totally different from that of the dentist. The person who consults a physician is sick, whereas he who consults a dentist usually is well. However, not infrequently, a small lesion within the oral cavity brings a patient to the dentist instead of to the physician. It is our aim to show the significance of the oral signs of systemic diseases, and to give the differential diagnosis of diseases in which oral signs and symptoms occur, with the hope that this information will bring dentist and physician into closer cooperation.

Figures 1 and 2 show classifications of oral symptoms in the order of their occurrence, and indicate the diseases in which these symptoms appear in the order of their respective importance. For example, in Figure 1, Oral Signs and Symptoms in Systemic Diseases, it may be seen that the symptom most frequently found was gingivitis, either associated with pyorrhea or as an uncomplicated condition. In the column headed "scurvy," this symptom is given a four-plus rating (that of a cardinal sign or symptom), indicating its diagnostic importance in this disease. The symbols three plus, two plus and one plus denote signs or symptoms of lesser importance. From the standpoint of dental examination, neoplasms of the oral cavity present the *greatest number* of oral signs and symptoms, and diseases of the blood the *most important* signs and symptoms. Renal and hepatic diseases have the fewest and least important symptoms. Figure 1 is presented to show that, in many instances, dental operations should not be undertaken until an accurate diagnosis has been made. For example, dental operations may prove fatal to a patient with a disease of the blood-forming organs. On the other hand, such operations are not contraindicated in the presence of a neuromuscular disease. Although the list of diseases is incomplete, it is believed that sufficient data have been presented to demonstrate the importance of oral manifestations of organic and infectious diseases.

It is extremely important, in cases of blood diseases, that accurate diagnosis be made as early as possible; otherwise, operative dental treatment may prove disastrous to the patient. Keen observation is a necessary attribute of the diagnostician in dentistry as well as in medicine. Any patient who presents, on dental examination, the following signs or symptoms should be examined for the presence of a disease of the blood-forming organs: pallor and puffiness of the

Read by Dr. Lucia at the forty-third annual meeting of the Dental Alumni Association of the University of California.

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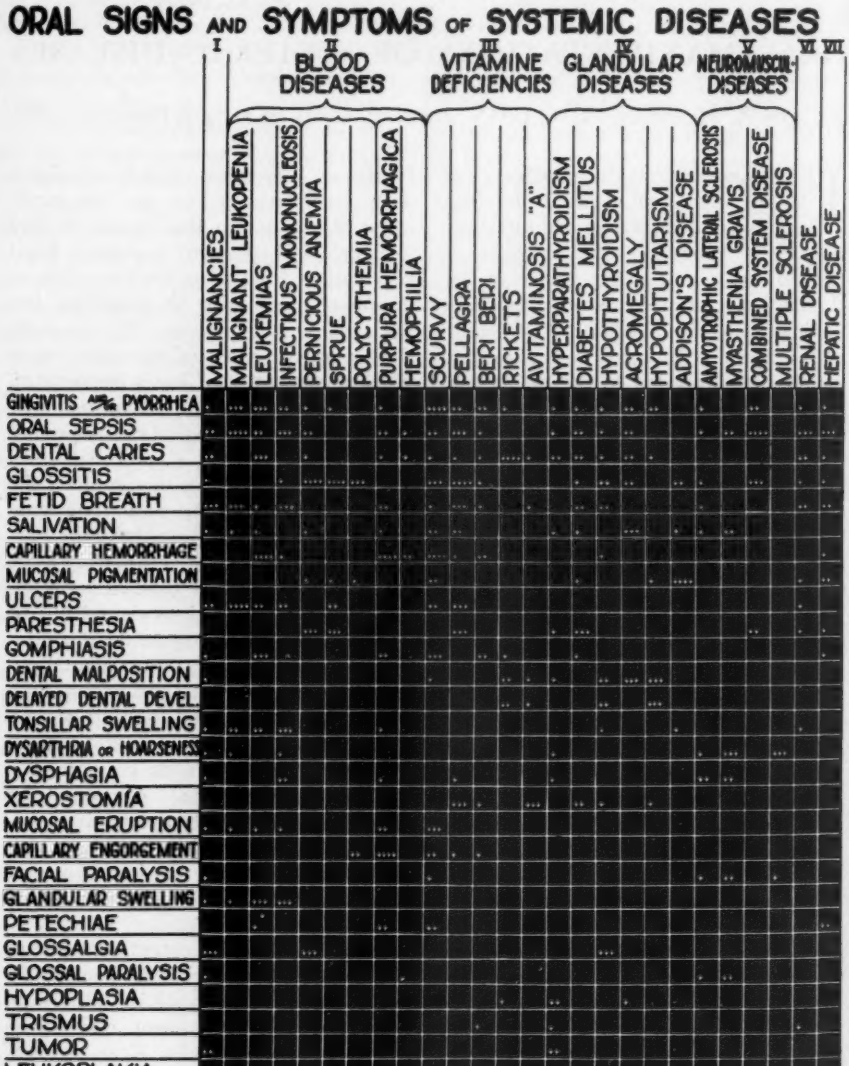

Fig. 1.

face, glandular and tonsillar enlargement, extensive gingival fibrosis and hemorrhagic oozing.

To protect such a patient from possible serious sequelae of a dental operation, a careful blood count should be made. The dentist should request a medical consultation if the blood count is in any respect abnormal. If the leukocyte count is high, leukemia should be considered; if im-

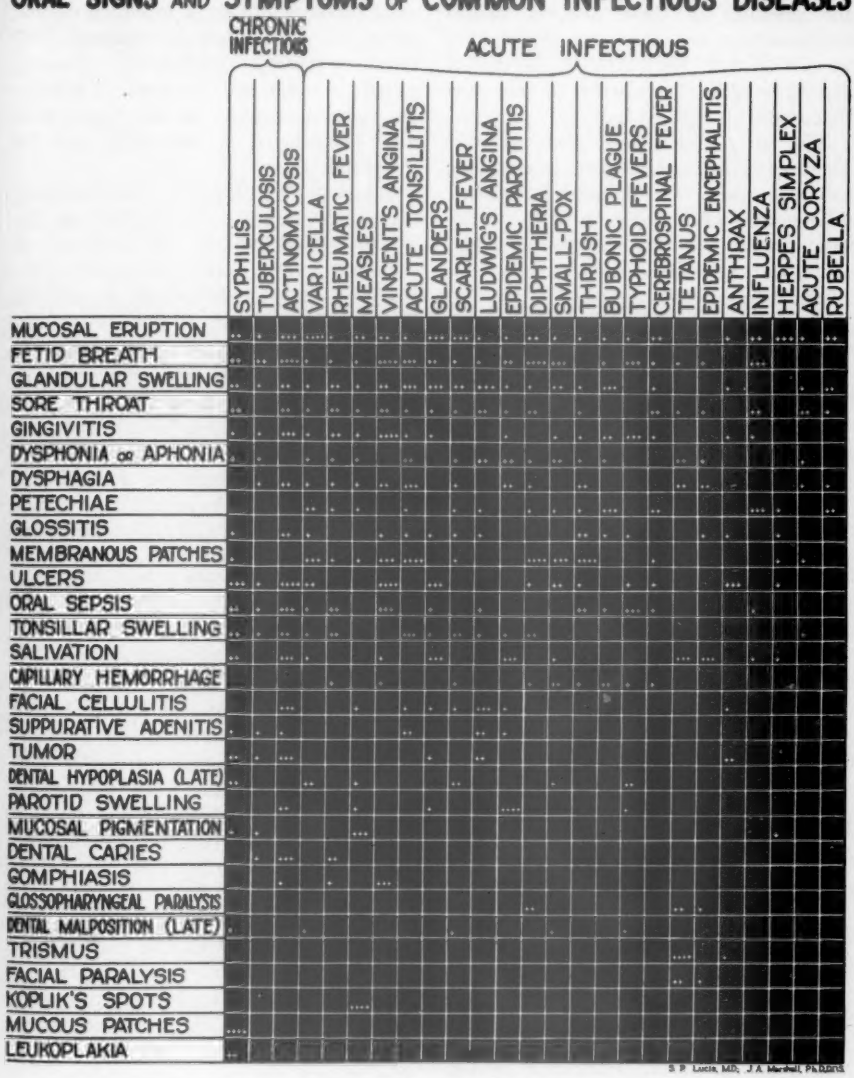

Fig. 2.

mature leukocytes predominate without leukocytosis, aleukemic leukemia. If the leukocyte count is low, malignant leukopenia is to be considered; if the blood platelet count is low, purpura hemorrhagica. If the erythrocyte count is low, chronic anemia should be considered; if the erythrocyte count is high, polycythemia.

The diagnosis of diseases due to vita-

min deficiency requires careful study. In the presence of these diseases, dental treatment not only may, but also should, be carried out. Furthermore, the dentist should be able to advise his patient how to correct his dietary habits.

The early diagnosis of glandular disease, especially in childhood, may provide an opportunity for corrective therapy. The patient with a disease of the endocrine glands is more apt to consult a dentist than a physician, early in the course of the disease.

The neuromuscular diseases are rare, and their presence has no direct bearing on dental procedures. These diseases, as well as renal and hepatic diseases, are degenerative and afford no contraindications for dental operations.

Among the oral signs, gingivitis and sepsis must always be regarded as possible manifestations of more general disease. These signs occur so frequently that their significance is likely to be disregarded. It is interesting to compare the difference in importance of various oral symptoms occurring in systemic and infectious diseases, as shown in the two charts. The list for systemic diseases (Fig. 1) is headed by gingivitis, followed by oral sepsis, dental caries, glossitis and fetid breath. In the list for infectious diseases (Fig. 2), mucosal eruption heads the list, followed by fetid breath, glandular swelling, sore throat and gingivitis.

Some of the dental abnormalities that have been listed in both charts, for example, hypoplasia, dental malposition and delayed dental development, are usually observed in patients long after the diseases have been cured. When a child has suffered from rickets or scarlet fever in the first ten or twelve years of life, osseous and dental changes make themselves apparent in early adolescence. In the case of dental hypoplasia, only the teeth undergoing formation at the time of the onset of the disease are affected. Those that had fully developed crowns will show no pits nor fissures on their axial surfaces, but teeth in which calcification is only partly completed will usually present roughened, uneven, pitted or whitened surfaces. Likewise, the normal eruption in the dental arch may be delayed or the teeth may be malposed.

Figure 2 lists some of the common, acute and chronic infectious diseases. In this group of diseases, the accuracy of diagnosis is of paramount importance for the protection of the dental operator as well as of the patient. In cases of syphilis, it is of especial importance that mucous patches, ulcers, mucosal eruptions and leukoplakia be recognized, and precautions of self-protection be taken by the dentist before any operative procedures are begun. In recognizing acute infections, reliance must be placed on evidence other than the signs and symptoms found in the mouth. In such cases, dental treatment can be performed without interrupting the medical treatment of the disease. A notable exception to this is the case of Vincent's infection or "trench mouth." If this disease is suspected, a blood count should be taken before arsenicals are used in treatment. Furthermore, all patients with evidence of Vincent's infection who have leukopenia should be completely examined, because the oral condition may be a manifestation of some blood dyscrasia, rather than Vincent's infection.

From the data which have been presented, it becomes apparent that medical and dental practitioners must cooperate if success is to be attained in the treatment of the diseases which have been mentioned. It is fruitless to attempt correction of only the oral manifestations of a constitutional malady if measures are not taken for specific treatment of the disease itself.

The authors acknowledge the kind assistance of Drs. M. G. Hoffman and Bertram Wolfsohn in preparing the charts.

THE PITFALLS OF ELECTROCOAGULATION

By David W. Phillips, D.D.S., Chicago, Ill.

An electric unit for electrocoagulation of gum tissue is a useful instrument for treating periodontal disease and, at the same time, a dangerous device in the hands of the uninitiated because, if the technic of electrocoagulation is not correctly carried out:

1. Healthy soft tissue and bone can be actually cauterized and destroyed well beyond the depth of the pocket.

2. Prolonged pain and sore mouth may occur.

3. Soft tissue proliferation and pocket recurrence may result.

This is primarily a practical paper. The purpose is definitely constructive: to assist dentists in avoiding the pitfalls of electrocoagulation in order that this useful method of treatment may not fall into disrepute because of the seeming lack of conservatism evidenced by some of the early advocates who have apparently failed to recognize its limitations and to warn of its dangers.

I have heard the method soundly condemned by some who have bought equipment and tried the treatment with very unfortunate results.

The recommendations to be presented are built on the background of my clinical experience in the treatment of more than fifty cases, almost half of which involved the entire mouth, and more than ten years of experience in surgical treatment.

PRETREATMENT

When electrocoagulation was first introduced, no preliminary treatment of the gums was recommended, and we were told to carry out prophylaxis after coagulation had been finished instead of before, because, when the soft tissues had sloughed away, the roots were exposed and it was much easier to see and remove the serumal calculus from the surfaces of the roots.

Very shortly after the introduction of this treatment, G. R. Lundquist strongly advocated thorough prophylaxis before treatment was begun. This is excellent advice and should never be disregarded.

I have found that a patient has the least soreness and pain and that the tissues heal most quickly with less tendency toward postcoagulative inflammation pain, soreness and soft tissue proliferation if the following points are faithfully observed before electrocoagulation is begun:

1. Thorough prophylaxis. This will take from one to six sittings.

2. Instruction to every patient to use a mouthwash of equal parts of hydrogen peroxide and water or a saturated solution of sodium perborate at least eight to ten times daily, forcing it back and forth between the teeth for a full three minutes by the clock each time in order to gain the maximum benefit of the nascent oxygen. Its use from eight to ten times is recommended, because many persons will use it only once or twice unless this is stressed. Cooperation by the patient is necessary if consistently good results are to be obtained. However, in certain mouths, the mucous membranes are delicate and are susceptible to irritation by these oxidizing mouthwashes. Their use should be discontinued as soon as this irritation is evident.

Microscopic findings reveal that in

practically 100 per cent of the cases of gingivitis and periodontoclasia, fusiform bacilli and spirilla are present in the gingival crevices and pockets. Because of the almost universal presence of these anaerobes, every case should first be treated as if it were a chronic Vincent's infection.

3. Instruction to all patients in the correct technic of brushing and stimulating the gums before a mirror. They should be required to continue this brushing three times a day until all gingival tissues are in the healthiest condition attainable by conservative methods. Also the patient should be required to use an interdental stimulator twice daily.

4. While prophylaxis is being carried out and until electrocoagulation is begun, regular treatment of all pockets by the dentist with an acid or the particular drug he deems advisable. If an acid is preferred, it should be used with extreme care and very sparingly.

Strict observance of these four points has, in many instances, when the patient has cooperated, resulted in such a healthy state of the gingival tissues and such a degree of physiologic resorption that I could not conscientiously put the patient through the discomfiture of coagulation.

Of course, full-mouth roentgenograms should always be taken, not only as a diagnostic aid but also as a guide in treatment.

The gingivae of every tooth about which electrocoagulation is contemplated at any sitting should be thoroughly explored to determine pocket depth about its circumference before coagulation is started. This provides a guide for the depth of electrocoagulation on every surface. It will also reveal, at times, that isolated teeth have normal crevices instead of pockets and the tissues do not need to be coagulated.

Obviously, a careful check should be made in every case of periodontal disease associated with the condition of occlusion, particularly in eccentric excursions, to ascertain whether traumatic occlusion is a contributing factor. If so, the necessary occlusal corrections should be made immediately.

TECHNICAL PITFALLS

The technic of electrocoagulation is a delicate one requiring perfect coordination and synchronization of foot, eye and hand. The very instant that blanching of the tissues is observed, either the electrical circuit is broken by the foot switch or the electrode is removed from the immediate field of operation. A fraction of a second of overcoagulation may enlarge the field of tissue destruction and increase the inflammatory reaction beyond the predetermined limits.

By all means overcoagulation should be carefully avoided. Undercoagulation is preferable because that can do no unnecessary damage.

I prefer to use current control points 2 or 3 instead of point 4, the point recommended by the manufacturer of the General Electric unit, because these points provide weaker currents and are not so critical. My experience indicates that there is a reduced tendency toward soreness afterward with the lower points.

I would advise any one who intends to take up electrocoagulation to master first the surgical treatment of periodontoclasia, because of the experience gained and because there is less danger of doing any serious damage. Furthermore, if the treatment of periodontoclasia is to be conscientiously practiced, we shall find a large proportion of cases wherein surgical measures are to be preferred to electrocoagulation if the patient's best interests are the first consideration.

Also, before starting the first case, one should practice coagulation on a piece of liver or veal steak repeatedly over a period of days, or at least until the procedure becomes almost automatic.

In the interests of more intelligent and cautious operative procedure, we should understand how electrocoagulation is accomplished, from the standpoint of simple physics as well as from that of therapeutics.

In cautery, tissues are burned. An apt description of electrocoagulation as applied to gums is that the tissues are "cooked" by the heat generated within the tissues themselves. The heat that destroys the living tissues in the field between and about the points of the electrode is produced by the high frequency current which passes through the tissues despite their resistance to the flow of the current. This resistance evolves considerable heat in a manner comparable to an ordinary electrical resistance heating element. In fact, it is the pressure of confined steam within the tissues which bursts the tissues with explosive force, as is evidenced by the popping noise often heard when pieces of soft tissue are blown away from the tooth being coagulated.

Electrocoagulation is a split-second operation requiring the utmost finesse.

SHOULD PROCAINE BE USED?

Of the early workers in this field, some stated that procaine is unnecessary and others recommended its use in every case.

Coagulation is usually painful or unpleasant to the patient. But some patients say that the injection is more disagreeable to them than the coagulation itself. Therefore, I have found it good practice to employ procaine in only about one-half of the cases that I have treated.

Because many are as much scared as hurt the first time coagulation is used, I usually employ procaine at the first sitting, continuing its use on nervous or highly sensitive patients.

In the majority of cases, I ask patients at the second sitting if they would like to try the treatment without procaine. I then tell them that thereafter choice will lie entirely with them; at the same time mentioning the fact that many find electrocoagulation less unpleasant than the hypodermic needle. This is quite helpful in dispelling fear and gaining confidence.

When procaine is desirable, it is used sparingly. Less than one-half the amount necessary to anesthetize the deep tissues for extraction is ample to anesthetize completely the superficial gingivae for electrocoagulation. Furthermore, the less procaine injected, the more rapid the recovery and healing of the tissues adjacent to the coagulated areas.

I have found that best results are obtained when a small quantity is injected very slowly a few millimeters apically of the bottom of the pocket and gently massaged laterally and occlusally or incisally throughout the tissue to be coagulated.

If the above-described technic of injection is carefully carried out, there will be little blanching of the tissues by the procaine and one can distinguish the blanching caused by the electrocoagulation much more quickly. This is important because it reduces the danger of overcoagulation.

THE LIMITATIONS OF ELECTROCOAGULATION

We have been told that pockets of almost any depth can be successfully treated by electrocoagulation. This is true, but, because the amount that can be coagulated in any one treatment is limited, deep pockets must be coagulated repeatedly until the entire pocket is destroyed. The deeper the pocket, the oftener electrocoagulation must be done. This means that the patient will be uncomfortable for an unnecessarily long time.

Those who advocate repeated electrocoagulation for deep pockets remind me of the man who could not stand to have his dog's entire tail cut off in one operation; so he had it cut off an inch at a time.

I find that coagulation is desirable only in cases wherein the pockets do not exceed 3 mm. and the entire pocket can be eliminated in one operation. In deeper pockets, surgical measures are definitely indicated because pockets of any depth can be treated in one operation with much less pain and little discomfort throughout the healing process if properly packed.

AFTERTREATMENT

The patient should be kept on the 50 per cent hydrogen peroxide mouthwash until healing is so complete that vigorous stimulation of the gums can be carried out with full comfort and freedom from bleeding.

The patient should be warned that the coagulated tissue will slough off usually in three or four days, more of the root surface being thus exposed, and that the tissues will be tender for some time.

Also the patient should always be warned not to attempt to brush the teeth or gums for at least two or three weeks in the areas of coagulation, and very gently in the beginning.

In case healing does not occur so rapidly as it should, treatment by acids is helpful.

The patient should be required to use an interdental stimulator as soon as the interproximal gums are sufficiently healed. Where soft tissue proliferation or bleeding occurs, it is often good practice to pack these areas with zinc oxide-resin paste, with the technic used after surgical procedure.

ADDITIONAL CAUTIONS

1. Whenever possible, spreading the points of the electrode apart more than 2 mm. should be avoided, because that destroys tissues too far beyond a line between the points of the electrode and results in greater tissue destruction, sloughing and after-pain. In fact, I have found it most desirable to keep the points somewhat less than 2 mm. apart when practical.

2. As a rule, no more than the tissue about three teeth should be coagulated at one sitting. In certain instances, it may be desirable to coagulate the tissue about six anterior teeth.

3. Areas in different parts of the mouth should not be coagulated at any one sitting. The work should be confined to one locality, one side of the mouth being left free from soreness so that the patient can masticate in comfort.

4. When coagulation is started on one side of the mouth, it is continued around the teeth on the same side at subsequent appointments until that side is completely finished. This leaves one side comfortable for eating during the treatment.

5. It is best not to start work on the other side until the side first treated is completely healed and comfortable.

The closest approach to ideal results is obtainable by coagulation in the condition seen so frequently where shallow pockets exist only in the interproximal spaces. This applies especially to anterior and bicuspid teeth. In such cases, the buccal, labial and lingual tissues are often found in relatively more healthy condition because of easier accessibility of the toothbrush for stimulation. There is usually more afterpain and soreness in coagulated buccal, labial and lingual tissues than in the interproximal spaces.

Also, surgical measures are sometimes preferred in molar interproximal spaces since it is more difficult to obtain a clean cut result here because of the buccolingual width of the interproximal spaces and the greater difficulty of properly placing the electrode for coagulation of the tissues gingivally to the contact point.

CLINICAL CLASSIFICATION FOR TREATMENT

Clinically, it is very practical to classify periodontal disease not due to systemic conditions in four stages in order to elucidate more clearly the particular stage of

the disease in which electrocoagulation can be most advantageously employed. The four stages with the preferred treatment for each stage are:

Stage 1. Simple gingivitis, in which the gingival crevice has not been deepened by severance of the peridental membrane and in which clinically true pockets could not be said to exist.

Treatment: Thorough prophylaxis is necessary, with drugs in the crevices; regular stimulation of the tissues with a toothbrush and interdental stimulator by the patient, and regular use of an oxidizing mouthwash.

Stage 2. Early periodontoclasia, in which true pockets exist up to a depth of about 3 mm.

Treatment: All the treatment recommended for Stage 1, followed by electrocoagulation, is employed.

Stage 3. Advanced periodontoclasia, wherein bacterial invasion has destroyed the peridental membrane to the extent that the pockets exist to a depth of from 3 mm. to more than one-half the length of the root.

Treatment: The treatment recommended for Stage 1 above is followed by surgical measures. This is the safest and surest method. However, there is less danger of an unsatisfactory result if the first stage is omitted before the surgical procedure than before electrocoagulation.

Stage 4. Very advanced periodontoclasia, in which pockets exist to a depth far in excess of one-half the length of the root.

Treatment: Extraction of the tooth is the treatment.

CONCLUSION

From the foregoing, it is manifest, in my opinion at least, that electrocoagulation has a definitely limited application in the treatment of periodontoclasia.

If we as dentists are to be placed above the level of mere mechanics in the minds of our patients, we must consider rendering a genuine health service in the elimination of primary foci of infection from the mouths of patients our first duty. The early recognition and treatment of periodontal disease is the most vitally important obligation of dentistry today.

Our responsibility to our patients requires that we become as skilled in the treatment of periodontoclasia in the second and third stages by electrocoagulation and gum surgery as we are in extraction for fourth stage treatment and prophylaxis in the first stage treatment.

Electrocoagulation is most certainly not a cure-all for periodontoclasia, and there are serious pitfalls incidental to its use.

However, intelligently and conservatively applied, it has a definite place in the treatment of that condition, which causes the loss of more teeth than any other and is responsible for more focal infection than all other oral pathosis combined.

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Editorial Department

OUR DETRACTORS

HEAVEN forbid that this profession of ours should ever arrogate to itself an undue importance. In any calling, or even in life itself, one of the salutary things is a just estimate of one's own qualifications. The moment that smugness begins to raise its foolish head, hope of advancement is irrevocably lost.

So much for one side of the picture. Now for the obverse side. We are frequently regaled by our detractors, not only from the outside, but also by members of our profession, with stories of our manifest limitations. And sometimes these stories have disastrous results. Take the case of the pulpless tooth, for instance, a problem that at one time threatened to rob humanity of most of its natural teeth. Even to this day, there are those who point a finger at every pulpless tooth and shout anathema. The obsession to which this craze has led constitutes itself a reflection on professional men. It does not help the situation to

say that most of the aberration in connection with this subject was initiated by medical men. It never seemed to occur to them that dentists had been studying the teeth for nearly a century, while most medical graduates had given very little study to them, and the majority had given none at all. The edict went forth and the senseless slaughter of the teeth began, aided and abetted in some instances by dentists themselves. The aftermath has been a sad reflection on the mental acumen of both medical men and dentists. A pointed instance of the ends to which the extraction of teeth may be carried on the advice of a physician has recently come to hand wherein nineteen sound teeth were extracted because of rheumatism, and the patient was left to the mercy of the full denture man. Incidentally, the rheumatism was not relieved in the least, a result that is too frequent.

As has often been said, if half the application and energy that have been called for in the attempt to restore by artificial means the ravages caused by the needless extraction of teeth had been devoted to saving and rendering healthy the natural organs, the people would have been better served and there would have been fewer cases of mouths pathetically crippled for life. When will men learn balance? All teeth cannot be saved. Dentistry has its limitations in common with every other activity of life, but our profession might have done vastly better than it has.

And that is not all. We might have ascended to greater heights of achievement in every activity of our professional lives if we had been given a little more encouragement and a little less criticism. Our detractors, from certain members of the medical profession down to the ballyhoo artists of the public press, who till recently have dubbed us "tooth carpenters," have done us much harm. Fortunately, there has been of late a great change for the better. Medical men for the most part are cooperating loyally and happily with us, and that powerful agent, the press, has developed a remarkably wholesome and encouraging respect for the name of dentist. All of this is to the good. A little commendation and encouragement is better than constant criticism, and although we are sometimes made painfully conscious of our limitations, it will do us no particular harm to be told once in a moon of certain of our successes.

After all, more good has been done in the world by creators than by critics, more by stimulating enthusiasm than by pointing out flaws. To transpose Shakespeare: The good that men do lives after them, the evil is oft interred with their bones.

If an estimate could be made of the harm done by our detractors, the sum total would be staggering; the good from carping criticism could be weighed with a feather or less. The one great lesson to be learned from our detractors is to ignore them. This is not always easy, but it becomes necessary if we are to cope successfully with them. From the cryptic remark of a medical man years ago to the effect that "a dental diploma is merely the badge of a partial culture," down to the criticism of the present day, the dental profession has had to withstand the buffets of its detractors, but thanks to the manifest service rendered humanity by the ministrations of the dentist, we are able to face the world, if not wholly absolved of limitations, at least with a reasonable degree of credit to our calling. Dentistry has been eminently justified even in the face of its most persistent critics.

Hold up your heads, ye men of wavering faith, our detractors are breaking ranks and the best is yet to come.

OPENING THE BITE

THE dental profession is noted for its penchant for indulging in innovations which offer any suggestion of improvement in technical procedures that may save time and labor to the operator.

This tendency to follow fads may not necessarily be considered a fault in every respect. Dentistry in its every phase is extremely exacting upon the operator both in its mental and physical demands, to say nothing of its demands upon the operator to keep abreast of the times in the technical advances made in dental operative procedures. His anxiety in this respect is impelled by a desire to make his work as easy as possible in order that he may, in the most capable manner, meet the requirements of his clientele. Thus his eagerness to try every innovation to the point of faddism may be considered an expression of the desire to keep pace with the advancement of his science. And while many of the fads which have occupied the attention of the dental profession have been evanescent in character, others have had a definite influence upon determining the trend of the development of dental technic and therapeutic procedure.

The latest operative procedure in dentistry that threatens to assume the proportions of a fad is the procedure for remedying the inevitable closing of the bite which results from the natural wear and tear on the

masticatory apparatus occurring through constant usage; and we are here expressing a word of caution lest a procedure that can be and is most helpful, in many cases, in correcting and avoiding serious maladies may be subjected to abuse from over-application to the point of counteracting its beneficial effects.

It was as far back as two full decades ago that attention was drawn to the deleterious effect upon the hearing that might result from changes occurring in the temporomandibular articulation because of an altered character of the structures comprising the joint.

In 1918 or 1919, the late Dr. George S. Monson, of Minneapolis, directed attention to the remedial possibilities offered by prosthetic dentistry in such altered conditions, by reporting numerous cases in which he had improved, and in some instances restored, the hearing by restoring the vertical dimension of the jaws through the means of artificial dentures. Monson's efforts were no doubt stimulated by the studies of the temporomandibular articulation made by Dr. H. J. Prentiss, of Iowa, whose histologic researches upon the temporomandibular structures revealed that marked changes were continually taking place in the meniscus of the condylar joint, as well as in the other tissues surrounding the condyle head and in the glenoid fossa, from constant use of the joint, to such an extent as to affect the hearing; and others, particularly Costen, have come forward with suggestions of other and probably less serious pathologic conditions occurring from the disturbance of the anatomic relations of the parts resulting from closing of the bite, namely, various symptomatic neuroses of the structures of the face and jaws.

In 1930, Dr. W. H. Wright, of Pittsburgh, made a notable contribution to the study of the mandibular joint and the application of the ingenuity and art of the prosthetist in correcting the bite, and this contribution really opened a new field of therapeusis for the prosthetist. Since that time numerous observers have confirmed the work of Monson, Prentiss and Wright and, later, Goodfriend, Costen, Harris and others have made valuable contributions to the subject. But recently a new interest has been aroused in the study of the temporomandibular articulation, and the beneficial effects of the operation of raising the bite—in some instances quite spectacular—have attracted the attention of many prosthetic dentists and medical practitioners; so much so that there appears to be danger of the indiscriminate and ill-advised application of the measure.

We do not raise any question as to the beneficial results that may be

and have been obtained in numerous cases from the operation of opening the bite, but we do raise a note of warning against superficial diagnoses leading to the operation in practically all cases where the hearing is affected or where there are neuroses of the face and jaws, the etiology of which cannot be readily recognized.

While it is readily understandable that the wearing down of the occlusal surfaces of the teeth may bring about changes in the temporomandibular joint, it is not so readily conceivable that the exact point of restoration of the vertical dimension is as readily ascertainable by all practitioners, particularly after a period of years in which Nature has been endeavoring to adapt herself to the changing and changed conditions.

The potentialities for harm in opening the bite too much are quite apparent, and the effect of such a condition may readily result in neuroses more serious and troublesome than the evils which the operator has sought to remedy in his efforts to restore supposedly normal conditions. In cases such as Maves has cited in which degenerative changes have taken place in the temporomandibular joint, the most conscientious and well-intentioned efforts may result in failure, unless accompanied by an intimate knowledge of the anatomy, pathology, physiology and histology of the structures.

However, we are in favor of promoting the procedure in selected cases, in that it is a dento-medical procedure which is apparently attracting the attention of the medical men. It seems probable and possible that this procedure may prove to be another interest in common that may further direct the attention of the medical practitioner to the importance of the masticatory apparatus as an organ vitally involved in the physiologic processes of the body, and—most hopeful and encouraging thought of all—may divert or ameliorate his, to us, incomprehensible, unreasoning and inexcusable attitude of indiscriminate extraction of teeth.

May we not cherish the hope that the medical man's observation of the relation of the masticatory apparatus to the general bodily health will help to create a respect for the teeth that will remove another serious handicap to the progress of dentistry. And, too, that it may be instrumental in awakening in the medical practitioner a realization of the fact that the teeth are not to be indiscriminately sacrificed simply as a precautionary measure against possible systemic complications or merely as a step in the process of diagnosis by exclusion.

L. P. A.

OBITUARIES

WILLIAM BEBB, M.Sc., D.D.S.

(1869-1938)

In the passing of Dr. William Bebb, the dental profession has lost one of the most colorful and scientific men in the profession. Probably no man in dentistry has had the rich and varied opportunities for scientific study that Dr. Bebb enjoyed in his research work in comparative dental anatomy.

Dr. Bebb loved the great open country, especially the wild mountain districts of the far west. For several years during the summer months, he camped out alone in the High Sierras, studying wild animal life, trapping animals for research work and gathering specimens for the museum. His collection was undoubtedly one of the finest in the country.

During the course of the famous Luetgert trial in Chicago many years ago, the only evidence left for identifying the murdered victim was the teeth and a few remnants of bones. Dr. Bebb became intensely interested during this trial in the development of that evidence. He decided then and there that he would study the teeth and bones of human beings and animals so that he could qualify as an expert. This was the real beginning of his career as a comparative anatomist, and, in this field, he became one of the leading men.

William Bebb was born in Fountaindale, Ill. (Winnebago Co.), June 15, 1869, the son of Michael and Anna C. Bebb. His father, a famous botanist, was generally known as "Bebb of the Willows." His grandfather William Bebb was governor of Ohio. Dr. Bebb was educated in the public schools of Rockford, Ill., but he did not finish his high school work. He attended the Chicago College of Dental Surgery and was graduated in 1897. For a short time, he practiced dentistry in Hinsdale and Chicago.

The lure of the Great West probably was too strong, for Dr. Bebb wended his way to California. In 1902, he became secretary of the College of Dentistry, University of Southern California, a position he held until 1912. At the graduation exercises held in Los Angeles, June 13, 1912, the honorary degree of master of science was conferred on him. In paying Dr. Bebb this compliment, the university expressed its appreciation of the attainments of one who as scientist, investigator, student and teacher had well demonstrated his worth and ability. His modesty and sincerity made him many friends, who joined in hearty congratulations on the honor conferred upon him.

In 1912, the Chicago Dental Society invited him to be their honored guest and present a paper on comparative dental anatomy. At this meeting, the society presented to Dr. Bebb a beautiful engraved testimonial in recognition of his remarkable attainments in his special field of scientific research. On several occasions, he was honored guest of the American Dental Society of Europe and he read papers at the meetings in London, Paris and Dresden.

In 1914, he accepted a position at Northwestern University Dental School as professor of comparative dental anatomy and curator of the museum, which he held until 1927. From 1924 to 1927, he also held the position of librarian.

On one occasion, Northwestern University Dental School sent Dr. Bebb on a four months' trip abroad to collect and

purchase dental books, pamphlets, rare prints and specimens for the dental library and museum. He brought back more than 2,000 books, numerous pamphlets and some very rare prints from that expedition. Owing to his keen knowledge and his untiring energy, he built up the library and museum to the largest and most complete in the country, now known as the "William Bebb Library and Museum." The library contains more than 12,000 volumes.

For several years, Dr. Bebb had been collecting the material and organizing a museum in McCormick Creek Park at Spencer, Ind., and as in all his other undertakings, he was doing a most excellent work for this museum. No man loved work more than Dr. Bebb. He represented the highest type of citizen and he leaves a host of loyal friends to mourn his loss. The museums he has built and the libraries he has collected stand as great monuments to his genius.

June 1, 1909, he was married to Miss Frances Ingle of Evansville, Ind., who, with five brothers and three sisters, survives him.

Dr. Bebb died in Spencer, Ind., April 7, 1938, from a heart attack. He was buried April 9, in Evansville, Ind.

FRED W. GETHRO.

FRANK A. DELABARRE, D.D.S., M.D., F.A.C.D.

(1867-1938)

FRANK ALEXANDER DELABARRE was born April 8, 1867, at Conway, Mass., the son of Edward and Maria L. (Hassell) Delabarre; died April 15, 1938, at Faulkner Hospital, Jamaica Plains, Mass.

Dr. Delabarre was educated at Mowry and Goff English and Classical High School, Providence, R. I.; Amherst High School, Amherst, Mass.; Amherst College, 1890 (A.B.), fellow, 1890-1891; Boston Dental College, 1891-1892; University of Pennsylvania, School of Dentistry, 1894 (D.D.S.); University of Pennsylvania, School of Medicine, 1895 (M.D.).

He had been in practice in Boston since 1895. From 1907 to 1910, he was assistant professor of orthodontia, and from 1910 to 1918, professor of orthodontia, in Tufts College Dental School. He acted as chief of the orthodontia staff and dean of the postgraduate school of orthodontia, Forsyth Dental Infirmary, from 1914 to 1919. In 1911, he was a member of the dental advisory committee of the Massachusetts Department of Public Health and president of the American Academy of Dental Science. In 1927, he was president of the New York Society of Orthodontists. He was a fellow of the American College of Dentists, past president of the Massachusetts Dental Society, president-elect of the American Association of Orthodontists and a member of the American Society for the Promotion of Dentistry for Children, of the European Orthodontological Society and of the Alpha Delta Phi and Delta Sigma Delta fraternities, of the latter of which he was Past Supreme Grand Master.

Dr. Delabarre was one of the most lovable and companionable of men. As a specialist in orthodontia for many years, he was naturally thrown with the younger members of society, and this comported perfectly with his natural inclinations. His sympathies were always enlisted on behalf of the afflicted, and this was particularly true if the affliction invaded the realm of childhood. He was always tender and compassionate, and no one ever appealed to him in vain. With a rare insight into the essential verities of life, he moved among his fellowmen with a sureness and balance that stamped him at once as a man of judgment and vision. He left a rich heritage of memories not only in his own family circle, but also among his wide circle of personal and

professional friends. Such a man is a distinct asset to humanity.

Dr. Delabarre is survived by his wife, Anna Elizabeth Delabarre, two daughters, Mrs. Robert Nathan Cram and Mrs. Dorothy Delabarre Fordyce, and a son, Laurence Hassell Delabarre, of New York. The funeral services were held at Mount Auburn Cemetery, Cambridge, Mass., April 18, with private interment in Pine Grove Cemetery, Conway, Mass.

CHARLES LANE, D.D.S., F.A.C.D.

(1884-1938)

CHARLES LANE, dean of the School of Dentistry of the University of Detroit, died of pneumonia April 28 in Harper Hospital after a week's illness. He was born March 28, 1884, in Goderich, Ont., and was graduated from the Royal College of Dental Surgeons in Toronto in 1906 and from the Chicago College of Dental Surgery, a branch of Loyola University, in 1909.

In 1911, Dr. Lane began private practice in Detroit. In 1934, he became head of the University of Detroit School of Dentistry, but continued to maintain offices in Eaton Tower.

He was a former regent of the American College of Dental Surgery, vice-president of the American Dental Association, ex-chancellor of the Michigan State Dental Society, a fellow of the American College of Dentists, past president of the National Society of Dental Prosthetists and a member of the staff of Harper Hospital.

He was appointed head of the department of operative dentistry of the University of Detroit School of Dentistry in 1933. Less than a year later, he was made dean of the school.

In 1912, Dr. Lane married Irene Grace Acheson, of Goderich, Ont. Surviving are his wife and five children: Mrs. Margaret Irene Griffen, of Detroit, William A. Lane, Katharine Louise, Mary Elizabeth and Dorothy Jean.

RICHARD C. YOUNG, D.D.S.

(1860-1938)

RICHARD C. YOUNG died March 12, 1938, at his home in Anniston, Ala. He was born in South Carolina, January 1, 1860. In 1877, he was graduated from the Philadelphia Dental College. He had an outstanding reputation as a student of all the dental sciences and was a general practitioner of exceptional ability.

For three or four years following his graduation, Dr. Young practiced dentistry in New York, whence he moved to Lancaster, S. C. In 1884, he was elected president of the South Carolina Dental Association. In 1887, he removed to Anniston, Ala., where he practiced until his death. He was elected president of the Alabama Dental Association in 1891. He taught oral surgery and orthodontia in the Southern Dental College of Atlanta from 1896 to 1907. He also taught in the Atlanta Dental College from 1908 to 1914.

Dr. Young was a man of fine culture and was endowed with an unusual quality of literary appreciation, which was his heritage. He recognized the close association of medicine and dentistry and his interest in the medical side of his calling was recognized by his being elected to honorary membership in the Calhoun County Medical Society.

He was most generous with his knowledge, both for the benefit of his patients and for the assistance of his brother dentists.

HENRY CLAY FERRIS, D.D.S.

(1870-1937)

HENRY CLAY FERRIS, of New York City, died on November 10, 1937, of a heart attack at his home in Garden City. He was a member and past president of

the New York Society of Orthodontists, honorary vice president of the First International Orthodontic Congress and a member of the New York Academy of Science, the American Society of Orthodontists and the European Orthodontic Society.

He was born in Brooklyn December 3, 1870, the son of the Rev. and Mrs. Daniel Ostrander Ferris. In 1889, he was graduated from Bordentown Military Institute and in 1892 from New York College of Dentistry.

He practiced dentistry in Brooklyn until 1906, when he was graduated from the Edward H. Angle Post-Graduate School of Orthodontia. Thereafter, he limited his practice to the specialty of orthodontia.

Dr. Ferris held a life membership in the Delta Sigma Delta fraternity and memberships in the honorary postgraduate fraternity of the New York University, Omicron Kappa Epsilon, the Loyal Legion of Honor, the Masons, New York Commandery and the Union League Club.

Surviving are three children, William H. Ferris, Mrs. M. Stanley Brown and Mrs. Carolyn De Angelis, all of New York.

CLYDE W. SCOGIN, D.D.S.

(1891-1938)

Clyde W. Scogin, major, U. S. Army, retired, former head of the dental department of Fitzsimmons General Hospital and nationally known for his research and active work in dental oral surgery, died at the hospital, April 26.

He was born in Bloomington, Ill. His family moved to Denver, which he always considered his home.

A 1916 graduate of the Denver University Dental College, he enlisted in the army in 1917, serving with the 89th Division in France and with the Army of Occupation at Coblentz, Germany. He returned to service at Fitzsimmons General Hospital in 1919.

In 1924, he was transferred to Walter Reed General Hospital at Washington, D. C. While there, he was associate professor of facial and oral surgery at George Washington University. In 1928, he was an honorary student at the Army Medical School.

He served in China from 1929 until 1932, at which time he was again transferred to Fitzsimmons General Hospital to take charge of the dental department. Failing health forced his retirement in 1933.

Always a student, he was the author of many articles on facial and oral surgery and the originator of other procedures in current use.

Major Scogin was a Shriner and a member of the American Dental Association.

His death removes from dentistry one of its leading workers in surgery as well as one who was loved and admired by all who knew him.

DEATH OF DR. ALBERT R. ROSS

It is with exceeding sadness that we announce the death of Dr. Albert R. Ross, Lafayette, Ind., Trustee of the American Dental Association from the Seventh District, which occurred on May 14th. A full obituary notice of Dr. Ross will appear in a later issue of The Journal.

DEATHS

Bayer, Francis, J., New York City; New York College of Dentistry, 1924; died March 1.

Barackman, W. G., Phoenix, Ariz.; Chicago College of Dental Surgery, 1904; died March 12; aged 58.

Carrick, C. C., Mason City, Iowa; Chicago College of Dental Surgery, 1900; died February 12.

Cassidy, Gregory P., Houlton, Maine; Tufts College Dental School, 1913; died March 31; aged 49.

Cunningham, C. W., Boone, Iowa; State University of Iowa, College of Dentistry; died February 14; aged 38.

Denman, Ray A., Beloit, Kan.; State University of Iowa, College of Dentistry, 1910; died February 7; aged 51.

Graf, Clarence Z., Chicago, Ill.; Northwestern University Dental School, 1910; died March 12; aged 57.

Hamilton, Charles M., Richmond, Ind.; died March 21; aged 81.

Harris, Herman J., Portland, Ore.; North Pacific College of Oregon, School of Dentistry, 1904; died March 23; aged 63.

Hays, F. T., Chicago, Ill.; Northwestern University Dental School, 1898; died March 5; aged 67.

Hayter, Mark, Dallas, Ore.; died February 27; aged 74.

Hughes, Claude N., Atlanta, Ga.; Atlanta Dental College, 1907; died recently.

Johnson, Harry C., Evansville, Ind.; Vanderbilt University, School of Dentistry, 1902; died March 17.

Johnson, Henry Clifton, Chicago, Ill.; University of Illinois, College of Dentistry, 1909; died January 25; aged 55.

Lucas, Edgar S., South Bend, Ind.; Chicago College of Dental Surgery, 1911; died March 17; aged 53.

Lyke, J. Clinton, New York City; College of Dental and Oral Surgery of New York, 1911; died March 18.

McGrath, Roger M., Denison, Iowa; Creighton University, College of Dentistry, 1925; died February 8.

McMillan, M. T., Goldsboro, N. C.; Atlanta Dental College, 1913; died recently.

Middleton, Earl D., Cleveland, Ohio; Western Reserve University, School of Dentistry, 1923; died March 10; aged 43.

Mohr, George H., Erie, Pa.; University of Pittsburgh, School of Dentistry, 1903; died February 21 of a heart attack; aged 61.

Murdow, A. H., Winnetka, Ill.; American College of Dental Surgery, 1894; died April 17.

Parkinson, E. E., Madison, Wis. Mr. Parkinson served as secretary of the Wisconsin State Dental Society for many years.

Quackenbush, Charles A., Ludington, Mich.; University of Michigan, College of Dental Surgery, 1896; died March 11; aged 64.

Randall, Frederic P., Chicago, Ill.; Chicago College of Dental Surgery, 1903; died March 19.

Root, Melvin A., Sr., Evanston, Ill.; Indiana University School of Dentistry, 1892; died March 12; aged 76.

Shelby, John A., Cascade, Iowa; Keokuk Dental College, 1904; died March 5; aged 57.

Sullivan, E. F., Boston, Mass.; Tufts College Dental School, 1917; died March 27.

Taylor, Charles F., Montgomery, Pa. Dr. Taylor met death March 21 on the Susquehanna River when the raft on which a centennial pageant was being staged struck a bridge.

Taylor, Franklin S., Hastings, Nebr.; Creighton University, College of Dentistry, 1914; died January 7; aged 47.

Thornton, Olin Dow, Portland, Ore.; died February 27; aged 65.

Waltman, Raymond S., Weatherly, Pa.; Temple University School of Dentistry, 1927; died April 4.

Warm, Miriam Funk, Cincinnati, Ohio; Ohio College of Dental Surgery, 1922; died April 4; aged 40.

Witmer, B. Frank, Lancaster, Pa.; Pennsylvania College of Dental Surgery, 1894; died February 25.

COUNCIL ON DENTAL THERAPEUTICS

POLIDENT—FALSE AND MISLEADING CLAIMS

A report of the Council on Dental Therapeutics of the American Dental Association, authorized for publication.

POLIDENT is advertised to the public, with the approval of the Good Housekeeping Bureau, for cleaning and purifying false teeth and removable bridges. The user "will be amazed" by this new way of cleaning that requires "no brushing." The appliance is soaked in Polident from five to fifteen minutes with the following results: "Even the worst stains and tartar are removed. Ends that *false* color—teeth become *live* and natural looking. Actually sterilizes." It is "approved by Good Housekeeping." "Thousands of happy users say that Polident is a real blessing. Keeps your mouth happy and healthier—your breath sweeter. Protects plates and bridges from wear and breaking. Good Housekeeping Bureau gives it their seal of approval. Just ask your own dentist—he will agree!" It is further declared to be "A Triumph of Dental Research!" And "Until Polident was perfected, the job of trying to keep artificial teeth and bridgework clean was almost impossible."

Despite the claim of intensive scientific research, Polident is nothing more than a mechanical mixture of trisodium phosphate, salt and sodium perborate. Actually, other products of this type were on the market before Polident.

The Council has had many inquiries concerning this product. Inquirers were advised that the composition of Polident was essentially similar to that of Stera-Kleen, which was previously reported on by the Council. (J.A.D.A., 22:1769, October 1935.)

The Council has, on other occasions, pointed out the feasibility of employing simple and inexpensive means for cleaning dental appliances. (A.D.R. 1937, p. 201.)

Apparently, the claims of the Wernet Dental Manufacturing Co., Inc., advertisers of Polident, were too much for the Federal Trade Commission. The following stipulation of facts between the Wernet Dental Mfg. Co., Inc., and the Federal Trade Commission, to cease and desist from making false and misleading advertising claims for Polident, is presented for the information of the dental profession:

FEDERAL TRADE COMMISSION
Washington

STIPULATION NO. 01820
(Public Record)

STIPULATION OF FACTS WITH VENDOR-ADVERTISER AND AGREEMENT TO CEASE AND DESIST FALSE AND MISLEADING ADVERTISING CLEANSER FOR FALSE TEETH

Wernet Dental Manufacturing Co., Inc., a corporation, Brooklyn, New York, vendor-advertiser, is engaged in selling a preparation for cleansing false teeth, designated POLIDENT, and in advertising represented:

"Dissolves . . . tartar . . . without brushing";

"In 5 to 15 minutes it looks like new";

"It sterilizes";

"Your dentist will recommend it highly";

"Ends that false look";

"You will get rid of your plate worries."

The respondent admits:

That POLIDENT will not remove tartar when formed as a hard incrustation;

That there is no evidence that POLI-

DENT will make any denture look like new in five to fifteen minutes;
That POLIDENT will not sterilize;
That there is no evidence that every dentist recommends POLIDENT;
That POLIDENT will not end false look of dentures; and
That POLIDENT cannot get rid of all "plate worries."

In a stipulation filed and approved by the Federal Trade Commission the vendor-advertiser admits making such representations and specifically stipulates and agrees in soliciting the sale of and selling said product in interstate commerce to cease and desist from representing directly or otherwise:

(a) That POLIDENT will remove tartar when formed as an incrustation;
(b) That POLIDENT will achieve any given results in a specified period of time unless supported by actual and competent tests and demonstrations;
(c) That POLIDENT will sterilize;
(d) That "your" dentist will recommend POLIDENT;
(e) That POLIDENT ends false look of dentures;
(f) That by the use of POLIDENT one will get rid of his plate worries;

and from making any other claims or assertions of like import.

It is high time that attempts to hang false and misleading advertising on the dentist by such phrases as "your dentist will recommend it" ceased. The product and its claims should stand on its own merits rather than make the dentist bear the brunt of false and misleading advertising. Dental societies can discourage such practices by refusing to admit such products to the advertising pages of their bulletins or to their commercial exhibits.

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

Anesthetics—Local*

Procaine Solution (2%) with Epinephrine 1:25,000-Denpro Brand: Each cubic centimeter is said to contain procaine hydrochloride, 0.02 gm.; epinephrine, 0.00004 gm.; sodium chloride, 0.005 gm.; calcium chloride, 0.0004 gm.; potassium chloride, 0.0002 gm.; sodium bisulfite, 0.002 gm., and distilled water.

Manufactured by Dental Products Company, Chicago, Ill. No U. S. patent or trademark.

Procaine Solution (2%) with Epinephrine 1:25,000 in Denpro Tubes, approximately 2.5 cc.

Procaine Solution (2%) with Epinephrine 1:50,000-Denpro Brand: Each cubic centimeter is said to contain procaine hydrochloride, 0.02 gm.; epinephrine, 0.00002 gm.; sodium chloride, 0.005 gm.; calcium chloride, 0.0004 gm.; potassium chloride, 0.0002 gm.; sodium bisulfite, 0.002 gm., and distilled water.

Manufactured by Dental Products Company, Chicago, Ill. No U. S. patent or trademark.

Procaine Solution (2%) with Epinephrine 1:50,000 in Denpro Tubes, approximately 2.5 cc.

Procaine Solution (2%) with Epinephrine 1:75,000-Denpro Brand: Each cubic centimeter is said to contain procaine hydrochloride, 0.02 gm.; epinephrine, 0.000013 gm.; sodium chloride, 0.005 gm.; calcium chloride, 0.0004 gm.; potassium chloride, 0.0002 gm.; sodium bisulfite, 0.002 gm., and distilled water.

Manufactured by Dental Products Company, Chicago, Ill. No U. S. patent or trademark.

Procaine Solution (2%) with Epinephrine 1:75,000 in Denpro Tubes, approximately 2.5 cc.

*A.D.R. 1937, p. 36.

Procaine Solution 2% with Epinephrine 1:50,000-Economy Company Brand: Each cubic centimeter is said to contain procaine hydrochloride, 0.02 gm.; epinephrine, 0.00002 gm.; sodium chloride, 0.002 gm.; chlorobutanol (chloroform derivative), 0.005 gm.; sodium bisulfite, 0.001 gm., and distilled water, q.s.

Manufactured by the Economy Chemical Co., Philadelphia, Pa. No U. S. patent or trademark.

Procaine Solution 2% with Epinephrine 1:50,000-Economy Company Brand in Cartridges, approximately 2.5 cc.

Procaine Solution 2% with Epinephrine 1:25,000-Economy Company Brand: Each cubic centimeter is said to contain procaine hydrochloride, 0.02 gm.; epinephrine, 0.00004 gm.; sodium chloride, 0.002 gm.; chlorobutanol (chloroform derivative), 0.005 gm.; sodium bisulfite, 0.001 gm., and distilled water, q.s.

Manufactured by the Economy Chemical Co., Philadelphia, Pa. No U. S. patent or trademark.

Procaine Solution 2% with Epinephrine 1:25,000-Economy Company Brand in Cartridges, approximately 2.5 cc.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information on the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

PRACTICE IN PARAGRAPHS

This department is intended for busy readers. It aims to tell a vivid story in a few words. Items should be of a practical character, and free from padding—not more than a paragraph or two. We exact no limit, but two hundred words can tell most of these stories. Send in your ideas; they will be welcome.

Bleaching Pulpless Anterior Teeth—There is discoloration which cannot be removed and in which a jacket crown is required. However, most cases may be returned almost to the former shade in from four to ten sittings of thirty minutes each. Among the exceptions are those discolored with the sulfide or oxide of metals. In discoloration due to decomposition of animal and other organic substances, bleaching is accomplished by removal of the residue, by conversion of material into soluble form. About one half the dentin next to the labial plate should be removed with a bur to slightly below the cervix. Then the following are used in the correct sequence: water, air, warm and cool, spirits of chloroform, sulfuric acid 50 per cent, household ammonia, ammoniated hydrogen peroxide, chlorine and a final lining of snow-white synthetic porcelain to replace the removed labial dentin. Ammoniated hydrogen peroxide is a mixture of household ammonia, 4 drops, in 10 drops of peroxide, mixed fresh at each sitting. Dry the cavity, apply for five minutes, dry, apply drop of pure ammonia one minute, wash thoroughly with warm water, dry cavity, apply spirits of chloroform, which is 90 per cent alcohol, and again dry.—*W. Clyde Davis, Lincoln, Nebr.*

Value of Roentgenogram—It is most important and desirable to take roentgenograms of each tooth or all teeth before extraction or any dental operation or examination. By doing this, we can intelligently and scientifically remove teeth. The x-ray film informs us of the direction or curvature of the root; the presence or absence of a cyst or abscess, root

fragments from preceding extractions and impacted supernumerary teeth; residual infections; parodontal conditions, etc. One cannot practice dentistry intelligently without the roentgenogram, correctly used and properly interpreted.—*Martin T. Siegel, Poughkeepsie, N. Y.*

Time and Concentration in Anesthesia—As time and concentration are essential factors in its action, any medicament should be held in contact with the field for a long enough period and in sufficient concentration to assure the desired action. Topical anesthetics may be applied on cotton to the site of puncture and left while syringes are loaded for local anesthesia. On the palate, an open mouth and a quiet tongue will help keep the pledget in place. The operator can tell the variation in pain by watching the patient's eyes from the beginning injection. Questions are not necessary. To get penetration of a germicide in preparation of a cavity, isolation with a rubber dam is best. The operator should permit Howe's solution or untinted tincture of metaphen to soak in for five minutes *by the clock* if he wishes to prevent secondary decay. Phenol swabbed around dentin walls and neutralized immediately with alcohol does not remain in contact long enough to act. Any table of bactericidal values will verify this. Phenol, too, is a coagulant and therefore self-limiting in its penetration. The other two drugs named are not so handicapped in working in dentin.—*C. H. Blanchard, Los Angeles, Calif.*

Cast Surveyor—A very inexpensive but completely adequate cast surveyor can be made by cutting the ring from an ordinary chemist's flask stand, and, at the same spot, parallel to the upright of the stand, soldering a tin tube about four inches long, molded to fit a Morse scaler handle, into which has been fitted a piece of pencil lead. The base of the cast to be surveyed is forced into a mold of "plasticene" on a small tray which rests on the floor of the stand. The pencil is then adjusted to the desired height by means of the thumb screw, and the tray containing the cast is moved around until the tooth to be surveyed is in approximation with the lead in the scaler handle.—*Bernard S. Chaikin, Boston, Mass.*

Exodontia—Compression and expansion of the alveolar process are salient principles of exodontia. In extraction of roots and difficult teeth, it is expedient to force tissues from roots, creating space for their movement. Thin, narrow wedge-shaped instruments designed for this purpose are excellent to condense and spread tissues around roots. They are carefully forced between roots and process at accessible points with hand pressure, usually on two sides, and then manipulated to loosen the roots. Removal is completed by prying or by grasping with pliers or forceps. The instruments used are mild steel (ordinary drill rod not tempered), which will bend instead of breaking and can be straightened for continued use. Hand pressure instruments should be of tempered steel.—*John V. Hackett, Chicago, Ill.*

For Engine Control—Did your engine control ever worry you, sliding around on a waxed floor? Sprinkling powdered resin (kept in a salt shaker) under the engine control will make it "stay put."—*Claude A. Moore, Lexington, Miss.*

Use of Disclosing Solution in Oral Prophylaxis—As the initial step in oral prophylaxis, mercurochrome 5 per cent is applied to the buccal and labial surfaces of all teeth. The patient then rinses out the mouth and is handed the hand mirror. The presence of unsuspected film and stain will be forcibly brought to his attention by the reddish discoloration produced. Thus, the need of more diligent home care and the value of periodic prophylactic treatments are emphasized.—*E. Warren MacKinstry, New Bedford, Mass.*

ASSOCIATION ACTIVITIES

RESEARCH COMMISSION

INFLUENCE OF VASOCONSTRICTORS ON THE TOXICITY OF PROCAINE ANESTHETIC SOLUTIONS

By M. L. Tainter, M.D., and A. H. Throndson, D.D.S., San Francisco, Calif.

At the present time, procaine hydrochloride is almost universally used as the local anesthetic in dental operations. To the solution is added either epinephrine, cobefrin or neosynephrine, for localizing the action and reducing the toxicity of the procaine. The two latter vasoconstrictors have been recently introduced in the hope of their being less toxic than, or otherwise preferable to, the commonly used epinephrine. If these agents have any real advantage, the differences should be demonstrable in experimental animals by appropriate methods. It is difficult to believe that their actions could be qualitatively different from those of epinephrine, since they constrict blood vessels and raise the blood pressure in a similar manner. Otherwise, they do not have any important differences from epinephrine.

There is, however, a clinical impression that the use of these epinephrine substitutes has been attended by fewer reactions or toxic manifestations in actual use. Therefore, we have studied the toxicity of procaine, containing these three vasoconstrictors, in animals, and have also compared the reactions and toxic manifestations from them which occur in human beings. The animal experiments form the basis for this paper; the clinical results will be presented subsequently.

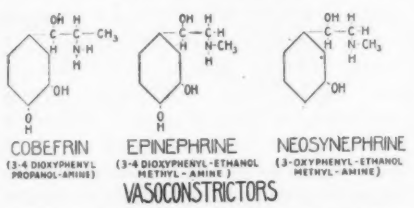

Fig. 1.—Structural formulas of cobefrin, epinephrine and neosynephrine.

The structural formulas of these compounds are depicted in Figure 1, which shows that cobefrin differs from epinephrine by having the methyl group on the amine radicle transferred to the side chain. Neosynephrine has the same side chain as epinephrine, but the parahydroxyl group is omitted. As previous reports by one of us[1-4] have discussed the details of actions of these compounds, these need not be recapitulated here.

RELATIVE POTENCY FOR BLOOD PRESSURE

Inasmuch as these agents are added to procaine for producing vasoconstriction,

From the Department of Pharmacology, College of Physicians and Surgeons, A Dental School.

Supported, in part, by grants from the Research Commission of the American Dental Association and from the California State Dental Association.

the first question that arises is "How much of one is required to be equivalent in vasoconstrictor action to one of the others?" In other words, what concentration of each agent is required to produce equal degrees of peripheral vasoconstriction? It is almost impossible to determine an absolute vasoconstrictor power for these compounds, but it is possible to estimate their relative potency. This can be done by determining how much of one is required to produce the same degree of action as a given amount of the other. This is equivalent to determining the ratio of dosage required for equal effects. Neosynephrine has been studied from this standpoint previously,[1] and it was found that 4.3 times as much neosynephrine as epinephrine was required to produce equal degrees of rise of blood pressure.

Similar values were previously determined for cobefrin,[1] but were not wholly reliable. In the present study, the corresponding ratio of this drug to epinephrine was found to be 3.3. This means that, if 1 :50,000 epinephrine is taken to have the desired vasoconstrictor potency, a solution of 1 :11,628 neosynephrine would have the same vasoconstrictor action, or about 1 :15,151 cobefrin. However, this ratio is not to be strictly interpreted as a measure of peripheral vascular constriction, because the blood pressure effects from which these ratios were obtained represent the sum of actions on the heart, central nervous system and blood vessels, and each of these may contribute to the pressor response.

An attempt has been made, in a paper to be published shortly,[5] to determine the relative activities of these compounds for the peripheral vessels alone by perfusing various concentrations through excised cat legs and measuring the constrictions produced. It was found that neosynephrine required an average of 14.9 times the concentration of epinephrine to reproduce the latter's vasoconstrictor potency, and cobefrin 2.48 times as much as the epinephrine. These values would indicate that a local anesthetic solution, to be equivalent to 1 :50,000 epinephrine, should contain 1 :3,355 neosynephrine, or 1 :20,080 cobefrin. The solutions actually marketed at the present time contain from 1 :2,500 to 1 :3,500 neosynephrine, or 1 :10,000 cobefrin, and therefore somewhat more of these constrictors than may be necessary.

In the present study, a redetermination of the ratios of pressor activity of these agents in pure solution has been made and compared with the ratios obtained when the vasoconstrictors were dissolved in the 2 per cent procaine solution in which they are employed ordinarily. This is necessary because of the possibility that the

TABLE 1.—COMPARISON OF DOSAGE RATIOS OF COBEFRIN AND NEOSYNEPHRINE WITH EPINEPHRINE FOR EQUAL PRESSOR ACTIONS*

Drug	In Sodium Chloride 0.9 Per Cent			In Procaine Hydrochloride 2 Per Cent			SD diff. means	Approximate Probability of Difference Per Cent
	Experiments No.	Ratio Average	SD mean	Experiments No.	Ratio Average	SD mean		
Cobefrin	5	3.3	1.16	9	2.5	0.54	1.15	50
Neosynephrine	5	10.9	2.6	4	33.6	17.9	20.5	69

*When administered intravenously to cats and the agents dissolved in physiologic saline solution, and in 2 per cent procaine hydrochloride, together with the standard deviation of the means (SD_{mean}) and the standard deviation of the difference between the means ($SD_{diff.\ means}$).

anesthetic might alter the response of the blood vessels to the constrictors. Table 1 presents a condensed summary of the results obtained on from four to nine animals with each solution. The table shows that the average amount of cobefrin required to cause equal blood pressure responses to a given amount of epinephrine was 3.3 times as large when the cobefrin was dissolved in physiologic saline solution and 2.5 as large when it was dissolved in the procaine solution. A typical pressure curve is shown in Figure 2.

These values have not been obtained on a sufficiently large number of animals

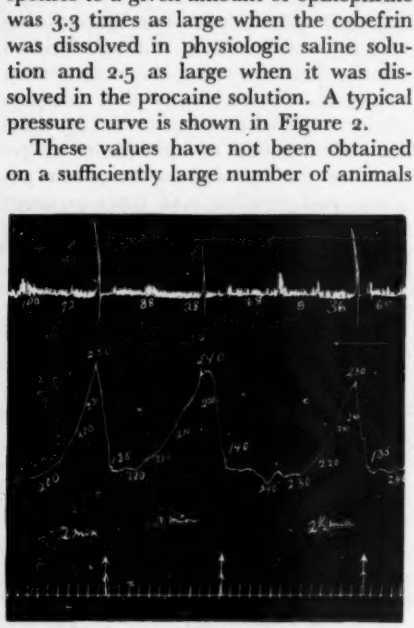

Fig. 2.—Comparison of effect of epinephrine and cobefrin on blood pressure and respiration. Two and one-tenth cubic centimeters of 1:50,000 epinephrine has equal pressor potency to 0.8 cc. of 1:10,000 cobefrin. Dosage ratio in this cat, therefore, equals 1.9; pentobarbital anesthesia. (In each of these figures, the bottom record is of the time in twenty-second intervals.)

to establish their magnitude with certainty, as shown by the standard deviations from the means, which were fairly large values in proportion to the ratios. However, it is safe to assume that they would not be changed any significant amount if an unlimited number of additional experiments were made. The question whether the ratio in the procaine solution was any different from that in the saline solution is of interest. This can be determined by calculating the standard deviation of the difference between the mean values according to standard statistical methods, and from this value calculating the probability of there being a significant difference between the two ratios; that is, a difference which is greater than would be expected solely from chance variation. For cobefrin, the calculations showed an even possibility that a difference of the size observed would have been obtained by chance alone.

These experiments, therefore, give no evidence that procaine modified the pressor potency of cobefrin under the conditions. Neosynephrine had a dosage ratio to epinephrine of 10.9, when dissolved in saline solution. This ratio was decreased to 33.6 when it was dissolved in the procaine solution. However, the latter results with procaine were so variable that the standard deviation was quite large, and the probability of there being a true difference between the two values was found to be only about 2 to 1. Therefore, the presence of procaine may decrease the activity of the neosynephrine about two-thirds, but it is not proved with certainty from these determinations.

If the cobefrin value of 2.5 is taken as an index of its actual activity when dissolved in procaine solution, as used clinically, the clinical solution of procaine-cobefrin should have a strength of 1:20,000 in order to give the same degree of vasoconstriction as the standard epinephrine solution. As a matter of fact, the clinical solution contains about 1:10,000 cobefrin, or about twice that necessary for the same degree of pressor response as the usual concentration of 1:50,000 epinephrine. In other words, the 1:10,000 cobefrin is more nearly equal to 1:25,000 epinephrine. If the 33.6 ratio for neosynephrine is taken as representing the true potency in the presence of procaine, the stock solution used clinically should be 1:1,488, in order to equal the 1:50,-

000 epinephrine; or it could be 1:4,587, if the lower ratio were the significant one. Since the clinical solutions of neosynephrine contain from 1:2,500 to 1:3,500, their activity seems to be about right for the necessary action, as indicated by these values.

COMPARATIVE ALTERATIONS IN THE CIRCULATION: INTRAVENOUS INJECTIONS

If the local anesthetic solutions containing these vasoconstrictors are to cause less toxicity in patients than the standard epinephrine-procaine mixtures, it would be reasonable to expect that they should cause smaller changes in the circulation for a given volume. However, when equal amounts of these stock solutions were injected, it was found that they do not cause equal degrees of change. As a matter of fact, the cobefrin and neosynephrine solutions cause considerably greater change in blood pressure and pulse rate than did the procaine-epinephrine solutions. This is well illustrated in Figure 3.

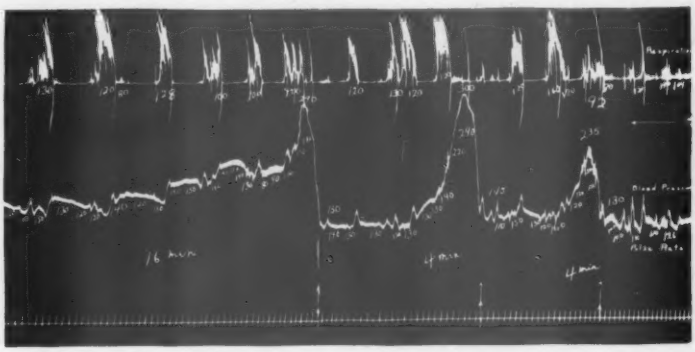

Fig. 3.—Effects of intravenous injection of 2 cc. of each local anesthetic solution on blood pressure and respiration of cat under pentobarbital anesthesia.

Two cubic centimeters of the stock anesthetic solutions was injected intravenously into a cat, and, as can be seen, the cobefrin and neosynephrine solutions had far greater effect on the blood pressure than the solution containing epinephrine. The cobefrin caused about double the pulse rate increase resulting from the other two agents. The duration of action of the cobefrin was about the same as that of the epinephrine, but the neosynephrine effect persisted four times as long. In other words, the conclusion seems inescapable that, if the local anesthetic were injected accidentally into a vein of a patient, it would cause a considerably greater circulatory reaction if it were the commercially available neosynephrine or cobefrin solutions than if the 1:50,000 solution of epinephrine were used.

Therefore, an attempt was made to determine the volumes of the commercial solutions required to have equal effects on the circulation. The proportionate volumes are indicated indirectly in Table 1, in the procaine-dosage ratios, although the data in the table take into account the differences in the concentrations used.

In Figure 4, which shows the results of an experimental determination of the effects, it can be seen that 0.8 cc. of the cobefrin and 1.2 cc. of the neosynephrine-procaine solutions were required to equal the height of change in blood pressure caused by 2 cc. of epinephrine-procaine solution. This, of course, shows the same disproportionate strength of these solu-

tions as is shown in Figure 3, but from a different standpoint.

It is worth while to note the changes in respiration. All three of these drugs, when injected intravenously, caused depression or stoppage of respiration. In the experimental animal (cat), the cobefrin showed the least effect, and the epinephrine the greatest, the latter stopping the respiration completely for about 100 seconds. In other records, cobefrin was as depressing to the respiration as were the other vasoconstrictors. The record in Figure 4, therefore, is not entirely typical in this one respect. The fact that these agents can depress, or stop, the respiration is an important phase of their toxic action to which we shall refer later. Consideration of these two figures indicates clearly that a patient is exposed to the danger of a greater change in circulation from using neosynephrine or cobefrin, in the concentrations used clinically, than from the use of epinephrine in the strength usually employed.

These figures, of course, apply only to intravenous injection. The objection might well be raised that these materials are not injected intravenously in ordinary clinical use. However, it is a matter of common experience that such injections are made occasionally by accident, and that the patient gets abrupt responses. The potential magnitude of these should be considered in the selection of a clinical drug of minimal actual or potential toxicity.

INTRAMUSCULAR AND SUBCUTANEOUS INJECTIONS

Ordinarily, local anesthetic mixtures are injected into muscular or fibrous tissue. Intramuscular injections permit fairly rapid absorption, although they are not, of course, as prompt acting as the intravenous. The greater the vasoconstrictor power of a compound, the less will be its absorption from the muscle, owing to the blood stasis, and the lesser should be the systemic manifestations. Figure 5 shows the results of injecting 5 cc. of these solutions intramuscularly.

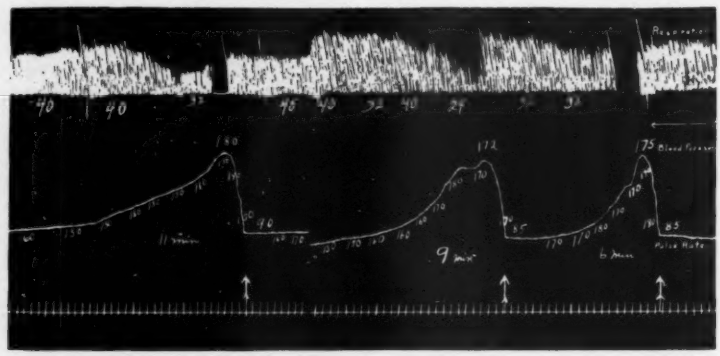

Fig. 4.—Volume of local anesthetic solutions required to give equal effect on blood pressure and respiration when solutions were injected intravenously into cat under pentobarbital anesthesia.

Figure 5 shows that procaine without a vasoconstrictor has no effect at all when injected by this route in rather large volume. This is because the body can detoxify procaine at an extremely rapid rate; i.e., it is destroyed about as fast as it is absorbed from the muscle. However, when vasoconstrictors are added, there is some rise of blood pressure, showing that they are not entirely localized and do not entirely stop the circulation in the areas of injection; that is, some of the

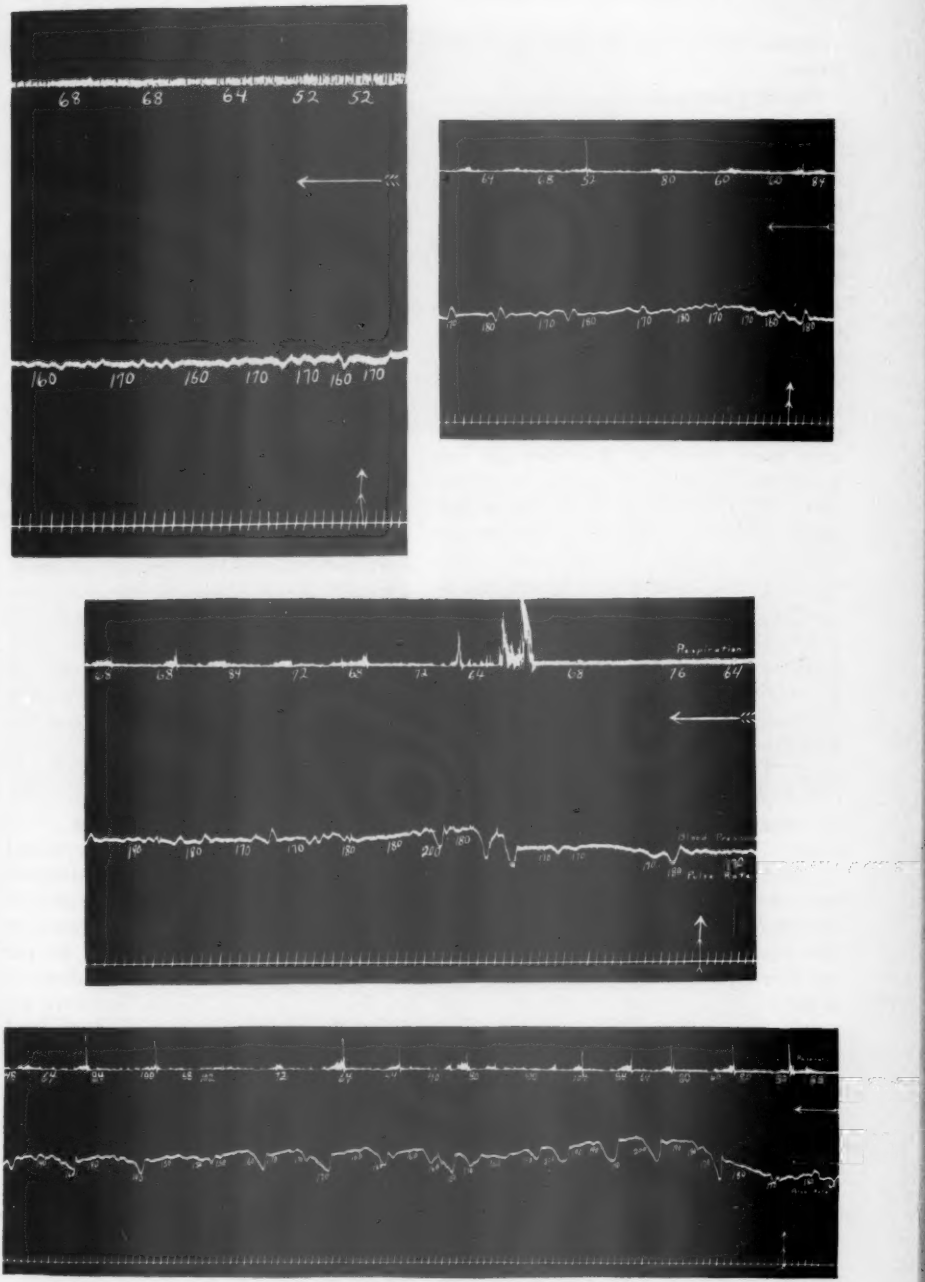

Fig. 5.—Effect of intramuscular injections of 5 cc. of 2 per cent procaine hydrochloride with and without vasoconstrictors. (Cat under pentobarbital anesthesia.)

solution escapes into the general circulation.

Figure 5 shows also that, after injection of epinephrine and cobefrin, there is a relatively slight rise of blood pressure, perhaps 20 or 30 mm., and after neosynephrine injection, a rise approximately double this magnitude. These differences should not be overemphasized, since the variability in response with intramuscular administration is very great. However, there can be no question that the duration of action of neosynephrine is very much longer than that of the other two vasoconstrictors. The rises of blood pressure come on very gradually and subside even more slowly, so that they are not very apt to produce symptoms in the patient. This is because the distress that patients feel is much more apt to be caused by sudden changes in the blood pressure than by those developing gradually.

Frequently, however, the injections are made not into the muscle mass, but into the fibrous tissue between the muscles or surrounding the nerve sheaths, which resembles most closely the subcutaneous areas. Figure 6 illustrates the effects on blood pressure of injections of 10 cc. volumes of the solutions into subcutaneous tissue. Absorption from this area is less complete than from muscle, so that the vasoconstrictor has a still greater power of blocking the absorption. Figure 6 shows that injection of even twice as much solution as was injected intramuscularly causes at most a rise in blood pressure that is not much greater than the spontaneous fluctuations in individual animals. It is seen (Fig. 6) that cobefrin caused the greatest change, although this is not a constant result. When the responses seen in Figures 2 and 3 from 2 cc. or less of these solutions intravenously are compared with the lack of change observed from 10 cc. injected subcutaneously, it can be readily appreciated that the accidental injection of only a small amount of the solution intravenously would cause a marked systemic reaction.

FATAL DOSES

The data thus far discussed indicate that the solutions containing epinephrine substitutes have greater effects on the circulation than corresponding volumes of epinephrine solutions. However, they do not show whether such responses would be a source of special danger to the patient from the standpoint of loss of life. It is obvious that, in people with hypertensive vascular disease or myocarditis, the changes in the circulation should be held down to a minimum, if possible. In such patients, there would be special reason for avoiding changes in the blood pressure. In those with normal circulation, there might be some reason for believing that circulatory stimulation might diminish the possibility of a fatal outcome from overdosage, and would actually decrease the toxicity of the anesthetic agent. In order to obtain data on this phase of the problem, fatal doses of the various solutions were determined in rats and cats under several conditions.

In white rats, the fatal doses of procaine solutions alone and procaine solutions containing epinephrine, neosynephrine or cobefrin were determined by injecting a range of doses intraperitoneally. In order to avoid the injection of excessive volumes of fluid, the procaine was used in a concentration of 10 per cent. The epinephrine concentrations used were 1 :10,000, which represents the highest conceivable concentration used for anesthetic purposes, and 1 :50,000, or the concentration customarily employed. The strengths of the other vasoconstrictors were those of the ordinary commercial solutions used clinically; namely, 1 :10,000 for cobefrin, and 1 :2,500 for neosynephrine.

Groups of rats were injected with doses of procaine ranging from 150 to 350 mg., dissolved either in physiologic saline so-

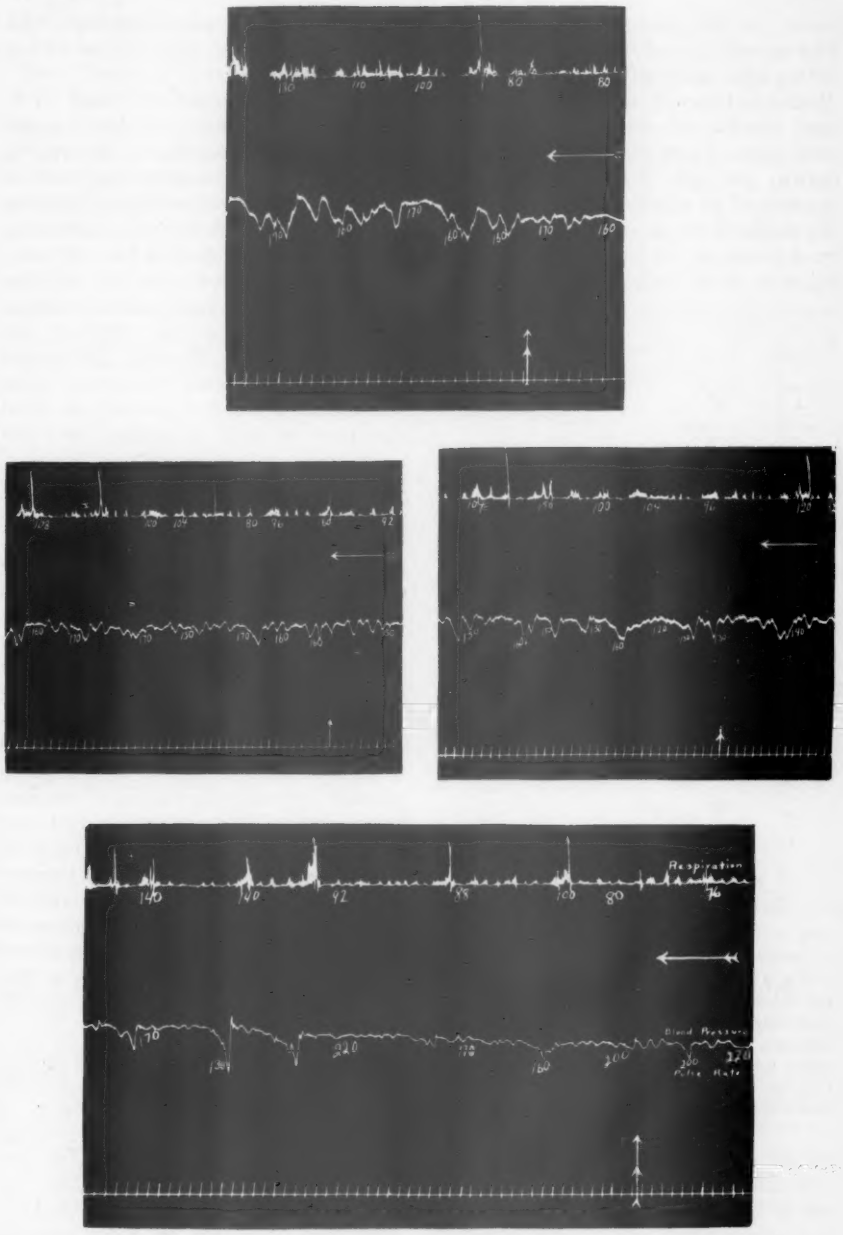

Fig. 6.—Effect of subcutaneous injections of 10 cc. of 2 per cent procaine hydrochloride with and without vasoconstrictors. (Cat under pentobarbital anesthesia.)

lution or the vasoconstrictor solutions. The percentage of those dying within twenty-four hours after each dose is indicated in Figure 7, which also shows the total number of animals injected with each dose. From the smoothed curves drawn through the mortalities, the amount of procaine which would cause the death of 50 per cent of the rats can be determined. It is seen that, for procaine in physiologic saline solution, the

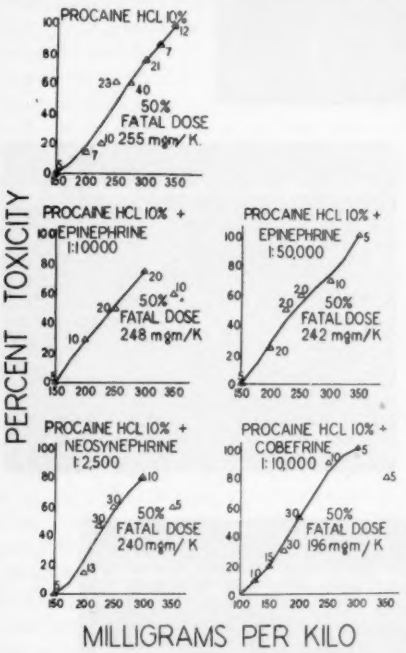
PERCENT TOXICITY
PROCAINE HCL 10%
50% FATAL DOSE 255 mgm/K.
PROCAINE HCL 10% + EPINEPHRINE 1:10000
50% FATAL DOSE 248 mgm/K
PROCAINE HCL 10% + EPINEPHRINE 1:50,000
50% FATAL DOSE 242 mgm/K
PROCAINE HCL 10% + NEOSYNEPHRINE 1:2,500
50% FATAL DOSE 240 mgm/K
PROCAINE HCL 10% + COBEFRINE 1:10,000
50% FATAL DOSE 196 mgm/K
MILLIGRAMS PER KILO

Fig. 7.—Mortality, in percentage, from various doses of 10 per cent procaine hydrochloride with and without the addition of vasoconstrictors, when injected intraperitoneally into white rats. The numerals on each curve indicate the number of rats injected with a particular dose.

50 per cent fatal dose was 255 mg. per kilogram. With the epinephrine and neosynephrine solutions, the values were 248, 242, and 240 mg., respectively. However, the cobefrin solution showed a markedly increased toxicity, since, with this compound in the procaine, 50 per cent of the animals were killed with a dose of 196 mg. of procaine.

The question might be raised as to whether these differences are large enough to be statistically significant. In order to determine this, the results from each of the vasoconstrictor-containing solutions were compared with the procaine results, by arranging in a four-fold table the mortality from a given dose of procaine against that of the same dose containing the added vasoconstrictor. With the null hypothesis and Fisher's Chi-square method,[9] a summated Chi-square value was obtained which expressed the total variations in pairs of curves when the mortalities were compared dose for dose. From this, the probability of significant difference was obtained from the chi-square table of probabilities.

These calculations showed that the epinephrine and neosynephrine solutions were not more different from the procaine alone than would be expected from chance variations only, but that with the cobefrin-procaine solution, the odds were more than 20 to 1 against such a difference occurring by chance. Therefore, the conclusion seemed justified that cobefrin actually increased the toxicity of the procaine solution. The rats usually died after asphyxial convulsions, and as a result of paralysis of the respiration. The increase in toxicity from the addition of cobefrin indicated either that the cobefrin was responsible for a greater depression of respiration than the procaine alone, or that there was invoked some other toxicity mechanism.

In order to determine whether similar effects could be obtained in another species, fatal doses were determined by intravenous injection of the clinical anesthetic solutions into cats. The cats were anesthetized with pentobarbital (35 mg. per kilogram) intraperitoneally. They were then connected for blood pressure records, and, in a part of the experiments, for artificial respiration, and the femoral

vein was cannulated for continuous intravenous injections. Solutions of procaine 2 per cent, or the same concentration of the anesthetic made up in either 1 :25,000 epinephrine, 1 :10,000 cobefrin or 1 :3,500 neosynephrine, were injected intravenously continuously at a constant rate of 0.5 cc. per kilogram per minute until the animal died, death being indicated by a fall of the blood pressure to the zero level.

In the first series either five or six cats were injected with each solution. The average fatal doses, calculated in milligrams of procaine per kilogram, are summarized in Table 2. The procaine alone killed the animals with an average dose of 30.9 mg. With epinephrine or neosynephrine present in the solution, the amount of procaine required to cause death was raised to 64.3 and 43.0 mg., respectively. Calculation of the probability that such a difference could occur by chance showed that, in each of these two cases, the odds were strongly against this being a chance difference. In other words, either epinephrine or neosynephrine was able to decrease the toxicity of the procaine to the extent that from 50 to 100 per cent more of the local anesthetic was needed to cause death. The explanation of this probably rests on the fact that by maintaining the blood pressure and circulation, the vasoconstrictors kept the blood flowing through the medulla (respiratory center) long enough to permit detoxification of larger total amounts of procaine. However, cobefrin-containing solutions showed an average fatal dose of 28.3 mg. of procaine, a dose slightly below that for procaine alone. Calculations of the probable difference showed that the increase in toxicity here was too small to be significant. Hence, it is necessary to conclude that cobefrin did not decrease the toxicity of the procaine in any manner analogous to that of epinephrine or neosynephrine. This is tantamount to saying that cobefrin

TABLE 2.—FATAL DOSES OF PROCAINE HYDROCHLORIDE CONTAINING DIFFERENT VASOCONSTRICTORS*

Solution	Cats Number	Mean Fatal Dose Mg. per Kg.	Standard Deviation Mean	Probability of Significant Difference from Procaine Alone Per Cent
No artificial respiration				
Procaine 2% alone	5	30.9	2.3	
Procaine 2% in epinephrine 1:25,000	6	64.3	7.4	97
Procaine 2% in cobefrin 1:10,000	6	28.3	3.8	39
Procaine 2% in neosynephrine 1:3,500	6	43.0	3.3	93
With artificial respiration				
Procaine 2% alone	10	454.5	117.1	
Procaine 2% in epinephrine 1:25,000	10	446.9	44.4	5
Procaine 2% in cobefrin 1:10,000	10	563.2	87.1	52
Procaine 2% in neosynephrine 1:3, 500	10	315.6	28.7	69

*When injected intravenously into cats in 2 per cent solution continuously at a rate of 0.5 cc. per kilogram of body weight per minute. Anesthesia: 35 mg. pentobarbital per kilogram intraperitoneally.

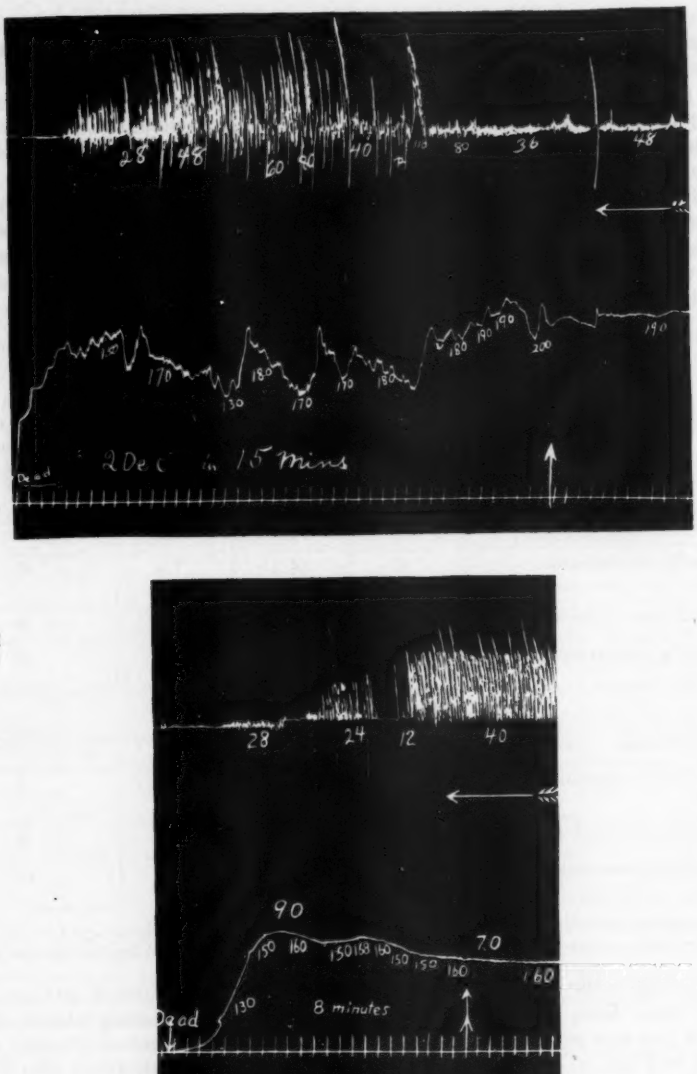

Fig. 8.—Typical effect on blood pressure, pulse and respiration when procaine hydrochloride 2 per cent with or without an added vasoconstrictor is injected slowly intravenously until death. (Cats under pentobarbital anesthesia, 2.0 kg. body weight.)

did not counteract the depression action of procaine on the respiration. It correlates with the increased toxicity of the cobefrin in the rats, in which death was also the result of respiratory failure.

A typical response to procaine alone

and to procaine containing epinephrine is shown in Figure 8. It can be clearly seen that in the first cat procaine alone depressed the respiration very quickly, as shown by decreased rate and volume and temporary stoppage. Finally, the respiratory activity decreased so much that the heart became anoxic, and an abrupt fatal fall of blood pressure occurred. In the second cat, of the same size, injected with procaine-epinephrine solution, the record shows that respiratory activity was maintained approximately twice as long, with adequate rate and volume. About double the amount of procaine was required to cause death, but the mechanism of death was again evidently paralysis of respiration, which was quickly followed by stoppage of the heart, as from procaine alone.

In a second group of cats, artificial respiration was maintained throughout the entire experiment. In these experiments, death was not due to respiratory failure, but rather to direct depression of the heart. Very large doses of procaine were required, and the results were more variable than those without artificial respiration. The average fatal dose of procaine alone, as shown in Table 2, was 454 mg., under these conditions. Cobefrin-procaine raised the fatal dose to 563 mg., this showing that the toxic effects of this vasoconstrictor were not elicited when adequate ventilation was maintained. On the other hand, epinephrine-procaine had a value slightly below that of procaine alone; whereas neosynephrine-procaine had a value of 315 mg., which was considerably lower than that of procaine alone. However, because of the greater variability in these experiments, despite the use of twice as many cats, the probability that these vasoconstrictors significantly changed the result from that observed with procaine alone is not very great. Therefore, we do not feel that these experiments proved any real differences in toxicities of procaine, in either the presence or the absence of the circulatory stimulants, when the toxic manifestations had to be exerted on the cardiovascular system.

COMMENT

The results of the experiments made with procaine vasoconstrictor mixtures do not give an uncomplicated answer to the question whether neosynephrine or cobefrin should be expected to diminish the clinical toxicity of the local anesthetic as compared to epinephrine. However, they leave no doubt that, for equal volumes, the clinical anesthetic solutions now in use and containing cobefrin or neosynephrine will have a greater effect on the circulation than will the 1:50,000 epinephrine commonly employed. If the injections are made perfectly into the muscle, subcutaneous tissue or fascia, there is much less possibility of toxic manifestations, and the differences between the solutions would appear to be negligible. However, the fatal effects demonstrated in these experiments indicate that cobefrin lacks the power of both epinephrine and neosynephrine to counteract the respiratory depression, which is the primary cause of death. Therefore, an overdose of a solution containing cobefrin would be more likely to be fatal for the patient than a solution containing either neosynephrine or epinephrine. If adequate ventilation is maintained by artificial respiration during such a poisoning, there is no real difference in toxicity among these various clinical anesthetic solutions, and the dose required to cause a fatality is about ten times as large.

The results obtained, of course, cannot be extended to functions other than those observed. The common subjective reactions in patients are palpitation, nervousness, sweating, fainting, etc., which are of psychic origin rather than from fundamental changes in vital functions. These studies, therefore, do not shed any light on the question whether a local anesthetic solution would be more pleasant to take when prepared with one or with the other of these vasoconstrictors, but they do in-

dicate that any threat to the life of the patient from overdosage will be less with either neosynephrine or epinephrine than with cobefrin.

Since all these solutions are generally satisfactory in clinical practice, the choice has to be made by estimating the relative importance of the minor or uncommon side actions. The present results should be taken into consideration in the selection of a local anesthetic, although their importance needs to be evaluated in the light of the patient's symptomatic responses to the solutions as well. We shall publish shortly an account of the effects and reactions from the use of these solutions in a large series of patients, which may permit additional conclusions as to the clinical usefulness or desirability. After considering together these two groups of results, the operator should have no difficulty in selecting the solution of choice for routine use, and for the unusual or abnormal patient.

SUMMARY AND CONCLUSIONS

1. In a comparative study of the toxicity of procaine hydrochloride solutions containing epinephrine, cobefrin or neosynephrine as vasoconstrictors, in the strengths used clinically, made experimentally, the vasoconstrictor potency of a 2 per cent procaine hydrochloride solution containing 1 :50,000 epinephrine could be matched by replacing the epinephrine with 1 :20,000 cobefrin, or between 1 :1,488 and 1 :4,587 neosynephrine.

2. When equal volumes of the commercially available local anesthetic solutions containing these three vasoconstrictors were injected intravenously, much greater rises of blood pressure and of pulse rate were produced by the cobefrin and neosynephrine-containing anesthetics than by those containing 1 :50,000 epinephrine.

3. When injected intravenously or subcutaneously, the same solutions increased the circulation only slightly. Procaine alone in clinical concentrations had no demonstrable effect.

4. When injected intraperitoneally into albino rats, procaine solutions containing 1 :10,000 cobefrin were significantly more toxic than equivalent solutions containing neosynephrine or epinephrine, or even the same strength of procaine solution without a vasoconstrictor.

5. When injected intravenously into cats without artificial respiration, solutions of procaine containing epinephrine or neosynephrine were, as judged by the volume required to produce death, definitely less toxic than those containing either cobefrin or no vasoconstrictor.

6. When artificial respiration was maintained during the intravenous injection of the anesthetic solutions, about ten times as much was required to cause the death of cats, and the presence or absence of the various vasoconstrictors did not definitely modify the results.

7. From the standpoint of serious or dangerous responses to the drugs studied, it appears that the commercially available local anesthetic solutions containing cobefrin or neosynephrine would have more potential danger for the circulation than the standard 1 :50,000 epinephrine solution, and that solutions containing either epinephrine or neosynephrine would be less likely to cause fatal poisoning than those solutions containing the usual clinical concentrations of cobefrin.

8. The ultimate clinical desirability of these various solutions may be determined after the relative importance of the present experimental differences is estimated in conjunction with the clinical reactions observed in patients.

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AN OPEN LETTER FROM THE ADVISORY COMMITTEE ON RESEARCH IN DENTAL CARIES

To all investigators, throughout the world, in the field of dental caries:

FOR several years, the Research Commission of the American Dental Association, in the performance of its special functions, has been aiming to publish clarifying summaries of the main findings in various fields of dental research. A collection of such summaries, if systematic and comprehensive, would present the main data and references in conveniently accessible form, facilitate convergence of researches on the chief problems and favor correct use of advanced knowledge by dental practitioners and all others concerned. The Commission now inaugurates this general plan, in direct relation to dental caries, by the following special procedure:

1. Each living person who, from research or clinical observation, has published findings and conclusions that bear in any way, directly or indirectly, on the cause or on the control of dental caries in man or animals is hereby cordially invited (a) to send, to the Commission, a concise summary of the basic findings of fact which, in his belief, warrant the conclusions that, as of a date to be specified by him, represent the essential results and his matured judgment of the outcome of his own study in this field; also (b) to indicate the location of the paper or papers in which his basic findings and conclusions have been published, and (c) to append, to the brief summary of his basic findings and conclusions, any supplementary statement that would seem to him to be necessary for adequate evaluation of his crucial results.

2. To illustrate the kind of brief, direct, matter-of-fact, up-to-date summaries the Commission desires to obtain directly from all living investigators in this field, we append the following example, prepared at our request by Dr. Bunting (for the sake of brevity in this open letter, a supplementary statement to be included in the published form has been omitted):

Bunting, Russell W. (for the Michigan Group Research on Dental Caries), April 15, 1938. 1. No consistent relationship has been found between hardness or perfection of teeth, nor state of mouth hygiene, and activity of dental caries. 2. No correlation has been demonstrated between amounts of salivary calcium, phosphorus, chlorides, pH, carbon dioxide capacity, total alkalinity, total solids or ash and activity of dental caries. 3. No relationship has been demonstrated between intake of calcium, phosphorus or acid-base dietary values and activity of dental caries. 4. Inherited tendencies or inherent individual characteristics, in a small percentage of cases, are more important determining factors in dental caries than ordinary dietary conditions. A great majority of caries-susceptible individuals, however, can apparently be benefited by adoption of very simple dietary measures. 5. No evidence was found that dental caries is produced by malnutrition or that it can be prevented by feeding adequate diets. 6. Sugar is an important factor in dental caries. A remarkably low degree of dental caries was observed in children on a low-sugar diet deficient in calcium, phosphorus and vitamin D. Active caries was induced in children by increasing sugar in-

take while they were receiving a diet that was nutritionally adequate. Ingestion of low-sugar diets by children is, as a rule, conducive to freedom from dental caries. 7. The most constant differential between caries-free and caries-susceptible individuals, thus far demonstrated, is that of the relative number of *L. acidophilus* organisms in the mouth. This correlation is approximately 90 per cent positive. 8. An immunologic principle antagonistic to *L. acidophilus* has been demonstrated in the blood of caries-free individuals, in whose mouths, as a rule, *L. acidophilus* does not exist and, when planted therein, promptly disappears. Publications presenting methods and findings: *J. D. Res.*, 13:415, October 1933; J.A.D.A., 20:2130, December 1933; *J. Nutrition*, 7:657, June 1934; J.A.D.A., 23: 846, May 1936.

3. (a) All of these summaries of outstanding actual findings, with bibliographic references, and brief and direct supplementary comment, when the stated results need interpretation or clarification, will be assembled in the alphabetic order of the names of the authors; (b) main findings and conclusions, in the same subdivisions of the field, will also be recapitulated in supplementary summaries; (c) an index of all authors, and of all findings and conclusions, will be included, and (d) the compilation will be published *in toto* or effectively abstracted for publication, as the Commission may decide. If publication of the whole compilation, and its wide distribution, should necessitate appeals for philanthropic funds, it is believed adequate support for this public project would be available.

The proposed compilation of summaries will separate clearly from many disagreements, abundant mistakes, numerous irrelevances, multiple republications, etc., the findings and conclusions that each worker, regardless of the length of time during which he has labored, the past variations and revisions in his views and the range of his studies, now regards as the outstanding basic results of his experience in this field. The compilation will be, in effect, not a series of abstracts of individual publications, but, instead, a direct authoritative crystallization of basic findings and conclusions as they now stand in each worker's studies of the cause or of the control of dental caries. We hope to receive promptly the effective cooperation of all active students of dental caries, wherever resident, and to be able to report completion of the initial phase of this effort at the next Annual Session of the American Dental Association in October 1938.

The general correspondence with observers and investigators will be conducted, for the Commission, by the secretary of the Advisory Committee. Responses to this invitation may be sent to him.

For the Research Commission, by the Advisory Committee on Research in Dental Caries:

Daniel F. Lynch, *Chairman,* 1149 16th St., N. W., Washington, D. C.

Charles F. Kettering, *Counsellor,* General Motors Corporation, Detroit, Mich.

William J. Gies, *Secretary,* 632 West 168th St., New York City.

SURVEY OF CERTIFIED AMALGAM ALLOYS

Samples of all amalgam alloys regularly certified to the Research Commission of the American Dental Association by the various manufacturers as listed herein were procured on the open market by the Research Commission and tested by the A.D.A. Research Associates at the National Bureau of Standards. As of May 5, 1938, the following list of amalgam alloys was found to com-

ply with American Dental Association Specification No. 1. Certified alloys which did not comply are omitted from this list.

Alloy	Manufacturer
Accurate Metalloy (filings)	The L. D. Caulk Co.
Ackerman (filings)	Ackerman Dental Mfg. Co.
Argentum ("A" Cut)	Hammond Dental Mfg. Co.
Aristaloy	Baker and Co., Inc.
Banner (filings)	Goldsmith Bros. S. & R. Co.
Blue Diamond (filings)	Reliance Dental Mfg. Co.
Brewster Medium (shavings)	E. R. S. Brewster
Brewster Quick (filings)	
Brewster Quick (shavings)	
Capeako (filings)	Precious Metals Refining Works
Certified	Lee S. Smith & Son Mfg. Co.
Coe	Coe Laboratories, Inc.
Cresilver	Crescent Dental Mfg. Co.
Diamond Edge	Young-Baker Co.
Dee (filings)	Thomas J. Dee & Co.
Excel	Daniels Dental Alloy Co.
Fleck's	Mizzy, Inc.
Minimax (filings) (shavings)	The Minimax Co.
173 173	
174 177	
177 178	
178 161	
180	
181	
183	
161	
Minimax White Gold & Platinum	
Mission No. 5	Henry F. Bruce Co.
Mission No. 5 "A" Cut	
Mission No. 6	
Modeloy (quick setting) (filings)	Crescent Dental Mfg. Co.
Ney-Aloy	The J. M. Ney Co.
Ney's No. 125	
Odontographic "Improved" (filings)	Odontographic Mfg. Co.
Pearlol	Wildberg Bros. S. & R. Co.
Preferred C	Precious Metals Refining Works
Preferred D	
Research Oralloy	Precious Metals Research Works, Inc.
Silver Crown	General Refineries, Inc.
Silver Crown Medium	
Silverloy (filings)	Crescent Dental Mfg. Co.
Silverloy (shavings)	
Speyer	Speyer Smelting & Refining Co.
S-C Medium (filings)	Stratford-Cookson Co.
S-C Quick (filings)	
True Dentalloy (filings)	The S. S. White Dental Mfg. Co.
True Dentalloy (Cut A)	
Uniform	Henry Nelms & Son
White Beauty	Lang Dental Mfg. Co.

BUREAU OE PUBLIC RELATIONS

GREAT OAKS FROM LITTLE ACORNS GROW

MORE than one million school children in thirty-five states have been reached with a preventive dentistry message during the past ten months. Probably twice that many persons have been contacted in one way or another by the American Dental Association's National Poster Contest. Judging from reports received from all parts of the country, this contest is the greatest dental educational effort ever promoted by organized dentistry.

Three hundred component and district dental societies in thirty-five states got behind Dr. Camalier's poster contest idea and pushed it to overwhelming success. A total of approximately 500,000 posters were displayed by the children in these 300 districts. It is only fair to estimate that these represented but 50 per cent of the number made. And it is only fair to estimate that the message that each poster contained reached at least four people—a total of 2,000,000 in ten months; and this without counting those reached by the hundreds of newspaper stories of the local and state contests.

Frankly, when the contest was launched last fall, the National Poster Committee had no idea that it would reach such gigantic proportions. However, the idea clicked from the very beginning both with the dentists and with educators. For a short time, it developed so rapidly that it threatened to get completely out of control. Requests for copies of the rules, ideas and slogans poured into the Central Office at such a rate that it was almost impossible to supply the demand. More than 70,000 copies of the rules were distributed and 20,000 reprints of the winning Minnesota posters of two years ago were furnished contestants. Mimeographed copies of suggestions prepared by the St. Louis Dental Society were also distributed. All told, more than 95,000 pieces of contest literature were mailed out by the American Dental Association.

Each of the 300 component societies held its own poster contest, which was divided into five divisions. Children in the rural schools comprised one division, children in the fourth to sixth grade of the urban schools comprised the second division. Junior high school pupils comprised the third division, senior high school students the fourth division and the students in vocational training schools the fifth division. Prizes were given in the local societies to the first, second and third winners in each division.

The winning posters in each component contest were entered in the state contest. The state societies presented prizes to the first, second and third winners of the state contest. All posters entered in the state contests, irrespective of whether they won a state prize, will be displayed at the National Contest in St. Louis next October.

The prizes awarded by the state and component societies were varied and many. They consisted of gold, silver and bronze pins, banners, loving cups, plaques, camping trips, books, dictionaries, atlases, encyclopedias, circus tickets, sight seeing excursions, radio instructions and certificates of honorable

mention. In addition, the American Dental Association gave each component and state winner a certificate of award.

The prizes to be given the winners of the National Contest next October consist of beautiful loving cups to the children themselves and a set of Encyclopedia Britannicas to the schools represented by the first prize winners in each division. Total prizes awarded by the national, state and component societies amount to approximately $3,500.

The United States Department of Interior Office of Indian Affairs has entered the Indian children in a contest of their own. Mr. Willard W. Beatty, Director of Education, has announced that:

Thirty thousand Indian children in Uncle Sam's Federal Indian schools have recently been enlisted in the American Dental Association's poster campaign for better understanding of dental health needs. This doesn't begin to cover all of the Indian children in the United States, for more than 50,000 of them are in public schools, but in the nation-wide campaign sponsored by the American Dental Association, many of these will also be reached.

Indian children in community day schools, far removed from any but occasional contact with whites, will add to their already important lessons in health conservation an intensive study of dental hygiene so that they may be prepared to illustrate their learnings in the form of posters which may carry the message to others.

Indian children in reservation and non-reservation high schools will also participate in the program, incorporating, it is hoped, many of the skills which have made Indian artists increasingly recognized for their talent.

Local competition will be centered around the reservation unit—that is, schools of a given territorial area will compete with each other, and the better drawings from these units be brought together for nation-wide comparison. After the best posters for the Indian Service have been selected, all of the drawings submitted to Washington will be sent to the American Dental Association's final nation-wide competition, in which white schools are participating, for final judgment.

Miss Helen Baukin, supervisor of dental hygiene in Hawaii, promises at least 100 typically Hawaian posters for the National Contest.

The accompanying photograph received from Charles W. Lyman, dental counselor of Oklahoma City, is a good illustration of the type of art work produced by American children. Dr. Lyman writes: "We received excellent cooperation from all parties concerned in the school system and feel that the contest itself, even if our posters never left Oklahoma City, was the most outstanding piece of dental education that we have had in this school system."

Dr. Lyman's opinion is echoed and re-echoed by hundreds of others throughout the country.

Hugh Wilson, Kansas state poster contest chairman, writes: "Personally I hope the contest will remain as a part of the national program for many years hence, since it does arouse much interest in dentistry."

W. G. Vernon, of Alexandria, La. writes: "As one of the judges, I can readily say that it went over big in this locality."

From Arkansas, P. C. Nordlinger writes: "I would say that the contest in this state has been a genuine success." We say so too, as the children in the central district of the Arkansas Society made approximately 3,500 posters.

Floyd W. Deatherage, in reporting the progress of the contest conducted by the Southern Illinois Component Dental Society, states that "in the opinion of the dentists, this contest has done a great deal to promote interest in better dental health."

As a matter of fact, Illinois dentists, educators and children have rallied nobly to the cause. Illinois children have made approximately 20,000 posters.

The Texas contest got away to a late start, but under W. L. Wier's direction, has made a glorious finish. So much interest was displayed at the state contest

BRUSH YOUR TEETH
BRUSH YOUR TEETH BEFORE
GOING TO SCHOOL
BRUSH YOUR TEETH
AFTER EACH MEAL
BRUSH YOUR TEETH
AFTER EACH MEAL
BRUSH YOUR TEETH
AFTER EACH MEA

in San Antonio that Dr. Wier's committee and the Texas woman's auxiliary insist on another poster contest next year. Nor is Texas alone. Many similar requests have been received from other state and component societies.

L. J. McRae, chairman of the poster contest committee, Memphis, Tenn., writes: "The request comes from teachers and pupils that we do the same thing next year."

T. E. Kallenbach, St. Louis poster chairman, is jubilant over the fact that St. Louis children made more than 4,600 posters, 1,600 of which were displayed in the grand ballroom of the Statler Hotel at the May meeting of the St. Louis Dental Society. Missouri State, under the direction of Leo F. Marre, produced approximately 7,000 posters.

E. Arthur Perry, president of the Bridgeport, Conn., Dental Association, in speaking of the local contest, sums up the situation exceptionally well by saying, "The entries as a whole show a great deal of talent and originality—and the results of the drive seem to indicate that while other countries have given their thoughts to destruction, we in America have directed our efforts toward conservation and the preservation of health."

Has the poster contest been a success? Judge for yourself. At least 5,000 of the best posters will be displayed at the American Dental Association meeting next October. Ten times that many could be displayed, if space and funds permitted; but 5,000 posters in the national contest will be a fitting tribute to a wonderful idea, successfully and enthusiastically carried out. The National Poster Contest Committee congratulates C. Willard Camalier for conceiving the idea. We thank the members of the state and component poster committees for the efficient manner in which they executed the idea. The American Dental Association is indebted to America's educators for their hearty cooperation, without which the contest could never have been held.

The thought expressed in the following couplet has certainly been exemplified by our officers and members in carrying the contest through to a successful conclusion:

"He who would do must first conceive.
He who would follow must believe."

The President of the American Dental Association conceived the idea; the members believed in it, and together they made it a success.

As one of the foremost school dental health educators said last February, "I was not overly anxious to enter the poster contest as my plans for the year were already laid out and I knew that the poster campaign would interfere seriously with my work. However, my superior officers in the American Dental Association asked for my cooperation and, being a good soldier, I gave them everything I had. I'm glad now that I did. The results obtained far exceeded my expectation. The teachers, the parents and the children are enthusiastic about it. It brought home the message of dental health more quickly and better than any project we have ever had."

Thousands of good soldiers in 300 component societies felt the same way. To them belongs the honor of having executed one of the biggest poster campaigns in the history of America.

NATIONAL POSTER CONTEST COMMITTEE
Lon W. Morrey, *Chairman*
J. M. Wisan
J. Ben Robinson
Vern D. Irwin
Mary H. Westfall
William B. Spotts

The National Dental Poster Contest. A few of the dental health posters made by the school children in Oklahoma City.

DENTAL HEALTH EDUCATION IN THE NEW YORK CITY SCHOOLS

By HAROLD G. CAMPBELL,* New York City

THE present dental health education program in the New York City schools goes back to the year 1915 when it was instituted by the division of educational hygiene of the department of education. Until 1915, there had been no organized effort to bring to the attention of parents the importance of preventive dentistry. Today, however, a definite program is in effect, largely as a result of a cooperative effort of the dental profession and the department of education.

It is generally believed by conservative dentists everywhere that most dental disorders can be prevented and that education is the most efficacious means by which this can be accomplished. If education is to be the basis of our approach, the dental health education program to be taught to pupils, parents and teachers should be authoritative, and the procedures by which it can be transmitted effectively should be as nearly uniform as possible. As research affords further enlightening data, supplementing or modifying our knowledge, changes should be made in the educational program.

REASONS FOR A DENTAL HEALTH EDUCATIONAL PROGRAM

It is not necessary to elaborate on the need for a school dental health educational program. More than 90 per cent of American school children suffer from oral defects. These defects and their serious sequels can, and frequently do, injure the child's health, retard his school progress, cause him unnecessary pain, affect his behavior and increase personal and community expense. A large percentage of dental disease, together with its attendant ills, can be prevented, provided preventive measures are inaugurated early in life.

The elementary schools offer the best opportunity for the application of dental preventive measures. Most modern educational systems throughout this country include in their curricula the teaching of health. Modern education welcomes the opportunity to improve the bodily health as well as the mental health of the pupil and is anxious to include in the curriculum the latest scientific facts and most efficient health teaching methods. The New York City Board of Education, superintendents, health supervisors, principals and teachers appreciate the importance of preventive health measures, and especially the value of dental health education. No single subject in our course of study in health education receives more attention than that of dental health. To be successful, the school dental health education program must be based on at least four sound pedagogic principles: (1) teaching scientific facts and principles; (2) developing correct attitudes or interests; (3) inculcating good health habits and practices, and (4) developing such skill as will lead to intelligent, healthful and happier behavior.

INSTRUCTION AND SERVICE IN DENTAL HEALTH

How do our schools provide for a program of instruction and service in dental health education? Let us follow the pupil from the time he enters school until he graduates.

On registration for entrance to a kin-

*Superintendent of schools.

dergarten or 1A class, each pupil is given an official physical examination record card, on which a physician and a dentist are expected to record the condition of the child's health, including the teeth. If a dental or any other physical defect is discovered, a follow-up system by the teacher, health counselor, school doctor or nurse is started, being continued until the defect is corrected. This follow-up service continues throughout the school term. Careful records are kept on each pupil's health record card.

Shortly after the opening of each new school term, in September and again in February, one whole day, known as school health day, is set aside for teachers, school doctors and nurses to test, observe and examine more than one million pupils for the discovery of apparent physical defects. This health inventory includes inspection of the teeth and observation of self-evident defects. Irrespective of the findings, each pupil is given a copy of the dental certificate, which he is expected to take to a dentist. A letter from the superintendent of schools accompanies this dental certificate, carrying a dental health message to parents, among other things advising them to take their children to a dentist for a more detailed and expert examination of the teeth, and for dental repair work if the dentist finds it necessary. The dental certificate further advises parents that regular visits twice a year give the dentist a chance to instruct the child in the selection of food, in the use of the toothbrush and in the general care of the mouth, teeth and gums. The dentist is expected to indicate on the dental certificate the nature of the work done, and to return the blank signed, on the completion of the work each term.

The dental certificate, as well as the semi-annual inventory, has a definite educational value, bringing to parents, as well as to teachers and pupils, the newer knowledge in dental health practice and procedures. It encourages parents to assume responsibility regarding the care of the children's teeth. The dental certificate also helps to establish one of the most important health habits that teachers can hope to inculcate, the semi-annual visit to the dentist.

For financial reasons, not all children in need of dental care can be treated by private dentists. For that reason, philanthropic services have been set up to take care of needy children. There are at the present time ninety-six school dental units, ably serviced and supervised by the dental division of the department of health, under the leadership of Harry Strusser, D.D.S. Assisting the forty-four part-time dentists who work in these school dental clinics are forty-nine dental hygienists. It is expected that eight additional dental units, of four chairs each, will be ready for service in eight new district health centers before the end of this year. This new, additional dental service will take care of children from 10 to 17 years of age. The school dental clinics take care of children from the kindergarten up to and including those in the 4B grade. During the year 1936-1937, the ninety-six school dental clinics took care of between 80,000 and 100,000 pupils, with a total of more than 300,000 individual treatments.

The school dental clinic program is essentially one of preventive dentistry. Although most of the school dental service is confined to the children attending that school, the school clinic also serves the neediest pupils of the kindergarten-4B groups of other schools in the vicinity.

Through the invaluable assistance of the Committee on Community Dental Service of the New York Tuberculosis and Health Association, a large number of needy children are cared for each year in the private offices of the many dentists who have volunteered their services. This community dental service was inaugurated several years ago at the suggestion of the Division of Health Education of the Board of Education, and with the

active support of the New York Tuberculosis and Health Association, its committee of dentists and volunteer dentists, thousands of children have been cared for who otherwise would have had to go without dental care. Dental service for such pupils is furnished at fees ranging from 50 to 25 cents, and, in many cases, at no cost at all. Last year, nearly 400 volunteer dentists in their private offices gave more than 13,000 treatments to approximately 3,000 needy pupils.

In addition to the dental services rendered by the school dental clinics and by private and volunteer dentists, dental clinics located in the neighborhood hospitals and dispensaries and dental centers such as the Guggenheim Dental Foundation, Columbia and New York University Dental College clinics have cared regularly for thousands of pupils.

In every school, the first order of business is the daily health inspection. Definite, prescribed time is allotted each school day for instruction in health matters throughout the pupil's school life. A modern course of study in health education outlines the health items to be taught. A careful review of the course of study will disclose that dental health matters are included in each grade. With the aid of supplementary materials, such as textbooks, dental leaflets, class and school bulletins, newspapers, posters, playlets, movies, auditorium lectures, health clowns, puppet shows and many other classroom activities of various kinds, opportunities are always presented for the individual pupil to acquire dental health knowledge and to develop desirable attitudes and good dental health habits through daily practice.

The subject of nutrition, for obvious reasons, is given special emphasis throughout all the grades in our course of study. In teaching the newer knowledge and practices of nutrition, we have ever in mind the preservation of dental health.

It is generally accepted by dentists, nutritionists and others in this field of research that effective dental care must begin in early life, and it is therefore to be hoped that the dental service of the district health centers for needy children which the city is about to provide will devote to the youngest age group a major portion of the time and effort expended. Such a policy will go far toward making it easier for the Department of Education and the Department of Health to solve the problem of combating disorders during the school life of the child and during the years after he leaves school.

It will not be easy, however, to solve the problem of preventive dentistry, for there are many factors—environmental, personal and economic—to be taken into consideration. Let us continue to do the best we can and to work together in the interest of all children.

OUTLINE OF STANDARDS AND POLICIES FOR A COMMUNITY DENTAL SERVICE PROGRAM

By ALFRED WALKER, D.D.S.; J. A. SALZMANN, D.D.S., and HARRY STRUSSER, D.D.S., New York City

IN setting up standards and policies for a community dental service, we must keep before us the following basic facts:

1. Dental decay is present in practically all age groups, beginning with the 2 year old, and not infrequently in even younger children.

2. As the child grows, decay increases rapidly, both in severity and in the number of teeth involved.

3. Dental neglect in early life leads to conditions that are either irreparable or of such a nature that the cost of satisfactory repair and restoration renders this service impracticable in a community program. As an example, the high school student who has not received periodic treatment during the earlier school years may be expected to present a major dental problem, requiring operative, surgical, orthodontic and very often prosthetic service, all of which may entail considerable time and expense.

4. Dental service is time consuming, and hence costly. Except for the important but limited work of the dental hygienist, it must be performed by the dentist himself.

5. A program designed to provide service for the greatest number should not contemplate a wide-spread ineffectual service, but a concentration of effort on those for whom the service will promise the most lasting benefits.

6. Any attempts to stretch facilities to meet the needs of all will produce little of permanent benefit and will lead to much waste of effort and money, resulting all around in disappointment.

7. Because of the foregoing facts, the most beneficial and economical service is early attention and a regular follow-up care.

To those unfamiliar with the problem of public dental care, a program based on the above-mentioned facts may appear rather harsh, if not altogether inadequate. However, it should be remembered that the potential demand for dental service cannot possibly be met with the personnel now available.

Furthermore, the importance of dentistry as a public health function is not yet fully realized by public authorities. It is unlikely that adequate funds will be made available for an all-inclusive program. It is better, therefore, to limit the program rather than to dissipate its benefits through inadequate widespread service.

Concentration of the community dental program on children is economical and offers the highest returns from the public health viewpoint.

STANDARDS

I. Children's Service.
  A. Preschool care.
    1. Examination.
      a. Mouth mirror and fine explorer.
      b. Bitewings (two films).
      c. Prophylaxis, if necessary.
    2. Education.
      a. Home mouth hygiene.
      b. Urgency of periodic examination and care.

c. Diet for sound teeth correlated to age of child. (Refer to physician if systemic involvement is suspected.)
d. Toothbrush drill.

3. Treatment.
a. Eliminate all sepsis.
b. Extract all teeth with infected pulps.
c. Extract all retained roots.
d. Treat all oral conditions. (Refer to physician if systemic involvement is suspected.)
e. Plan all fillings for maximum service and for the duration of the life expectancy of the tooth. Amalgam should be used as a filling material wherever feasible.
f. Refer to orthodontist cases showing possible need for orthodontic treatment.

B. School children's dental service.
1. Examination.
a. Mouth mirror and explorer.
b. Bitewing films (two large films.)
c. Prophylaxis.

2. Education.
a. Home mouth hygiene.
b. Urgency of periodic examination.
c. Diet for sound teeth correlated to age of child. (Refer to physician if systemic involvement is suspected.)
d. Toothbrush drill.

3. Treatment.
a. Make every effort to preserve the first permanent (sixth-year) molar.
b. Fill all pits and fissures in permanent teeth.
c. Extract teeth with diseased pulps. (Routine pulp-canal therapy should not be undertaken unless the prognosis is favorable and facilities are at hand for successful treatment.)
d. In pulp capping or pulpotomy follow accepted technic, provided the prognosis is favorable.
e. Treat all oral infection. (Refer to physician if systemic involvement is suspected.)
f. Follow accepted principles and methods in preparation and filling of all cavities.
1. Anterior teeth: Use silicate or gold foil.
2. Posterior teeth: Use amalgam or other approved filling material.
g. When teeth are missing, use space maintainers, bridges and dentures to preserve the normal occlusal relation.
h. In cases suggesting need for orthodontic treatment, refer patient to orthodontist.

II. Adult Service.
A. Examination.
a. Prophylaxis.
b. Mouth mirror and explorer.
c. Full mouth x-ray examination.
d. Three large bitewing films.

B. Education.
a. Home care of mouth.
b. Urgency of periodic dental examination and care.
c. Social and esthetic values of dental care. (The adult is more receptive to this aspect.)

C. Treatment.
a. Relieve pain.
b. Extract non-savable teeth.
c. Eliminate all oral pathosis.
d. Perform surgical operations necessary for preservation of dental and general health.
e. Place fillings and make restorations necessary to insure proper function.
f. Make esthetic restorations necessary to secure or maintain employment.
g. Do not undertake root canal therapy (routine) unless the prognosis is favorable and facilities are at hand for successful treatment.

POLICIES

1. Ethics. The ethics of practice and attitude toward patient should be the same as is usual in private practice. Appointments should be kept promptly and insistence expressed that patients keep appointments promptly. Deposits should be forfeited or a charge made for broken appointments.

2. Appointments. Patients should be given definite appointments of such duration as

will allow for a complete operation during each visit, if possible. Conversely, the dentist should not undertake more operations in one visit than accepted practice would dictate.

3. Patients. Dentists should not undertake to treat more patients than can be comfortably accommodated in the time available.

4. Operating Equipment. It is understood that dentists undertaking to render service in a community program will be adequately equipped for a complete oral dignosis, for operative procedures and for the maintenance of asepsis.

5. Specialists. Dental operations requiring specialized skill should be referred to specialists.

6. Financial Consideration. When only limited funds are available, concentration of costly operations involving few teeth should be avoided in the interest of preserving a greater number of teeth involving less costly operations, although consideration of the patient's health should be paramount.

7. Supervision. The community dental program must necessarily be conducted by a responsible central authority. Any authority assuming the responsibility of sponsorship is obliged to exercise some measure of supervision. The extent of such supervision depends largely on the basis of organization of the community program, the extent of services rendered and the method of paying for such services. Sponsorship or endorsement of community dental programs carries with it moral obligations to the public and to the profession.

8. Arbitration. In the rendering of services on a community basis, there are bound to be differences of opinion. These shall be referred to a grievance committee composed of dentists for arbitration. At the further request of the patient, disputes may be referred to the American Arbitration Association.

Exhibit of the Minnesota State Department of Health, Child Hygiene Division, at the Minnesota State Dental Association Meeting, St. Paul, February 22-24, 1938.

DENTAL ECONOMICS

DENTAL SERVICES IN GREAT BRITAIN*

HISTORICAL SURVEY OF DENTISTRY

DENTISTRY in Great Britain has only very slowly achieved the dignity of a profession. It was not until after 1700, and particularly in the latter half of the eighteenth century, that important advances were made in the study of dentistry, and gradually a certain number of medical men specialized in dental surgery. By 1800, there were numbers of skilled dental surgeons and dentistry was being taught at Guy's Hospital, but there were also large numbers of men who were not doctors, some skilled and some unskilled, who practiced dentistry. As early as 1840, some prominent dentists began a movement to exclude unskilled men from the right to practice. This struggle lasted for nearly forty years and achieved partial success with the passing of the Dentists' Act, in 1878.

This Act empowered the General Medical Council to keep a register of dentists and to supervise an examination system. The Act admitted to the register those who were in bona fide practice in 1878 and did not exclude many of the unqualified practitioners, merely prohibiting them from using the title "dentist" or "dental practitioner."

Those excluded from the register after 1878 because they lacked qualifications varied from relatively skilled men to the entirely unskilled tooth extracters. The registered dentists formed the British Dental Association in 1880, and the better type of unregistered dentists formed a society which, since 1913, has been known as the Incorporated Dental Society.

In prewar years, it became increasingly evident that some reform was needed. Finally, in 1921, an act was passed definitely prohibiting the practice of dentistry except by duly registered medical or dental practitioners. An exception was made in the case of unregistered men employed to do minor dental work in a public dental service. Other classes which were allowed to register were (1) members of the Incorporated Dental Society; (2) those who for five years in the period 1914-1921 had been practicing dentistry; (3) those who were practicing at the time of the act and who succeeded in passing a prescribed examination within two years, and (4) recognized chemists and druggists who had a substantial practice in dentistry including all the usual dental operations.

ORGANIZATION OF THE DENTAL PROFESSION

The Act of 1921 set up the Dental Board of the United Kingdom. This dental board, which is subject to the control of the General Medical Council, has thirteen members and is responsible for the discipline of the profession. This board inquires into cases of unprofessional conduct and keeps a complete register of all the dentists. The board may not suspend or erase names on the register, but may only recommend cases for disciplinary action by the General Medical Council. There is an appeal to the high court against decisions of the

*Extracted from "Report on the British Health Services," PEP (Political and Economic Planning), December 1937.

General Medical Council in relation to dentists, although not to physicians.

Qualifications such as are acceptable for registration can be obtained at twelve universities in the British Isles and three royal colleges of surgeons, and from the Royal Faculty of Physicians and Surgeons of Glasgow. Registration now entails at least four years of professional training, of which at least two must be spent at a dental hospital or in the dental department of a general hospital recognized by the licensing body. As a result of the Act of 1921, 8,000 persons without academic qualifications were admitted to the dental register, but the ratio of qualified to unqualified men has been constantly rising. On the Dental Register of 1937, there are 14,706 persons, of whom 57.07 per cent have academic qualifications.

The board initiates research, makes grants to dental schools, gives loans and bursaries for students and institutes prosecutions for illegal practice. In 1935, it spent £21,000 on bursaries and equipment in dental schools, and £4,500 on research. It also spent £4,000 on dental health education in the form of pamphlets, advertisements and films for school children.

PROBLEM OF DENTAL HEALTH

It is estimated that about 95 per cent of the elementary school population in England are subject to dental caries. It was stated in 1924 that 96.8 per cent of the navy recruits required dental treatment.

The richer sections of the population go to dentists in private practice and pay substantial fees. However, a quotation from the report of the chief medical officer to the Ministry of Health in 1933 states,

> The large bulk of the population, particularly amongst the industrial classes, is so accustomed to conditions of dental disease in themselves and their neighbors, and so little convinced that these conditions bear any relation to general health that, even if adequate dental services for all classes could be provided immediately, it is unlikely that more than a small percentage of those in need of it would avail themselves of the opportunity of obtaining dental treatment. Even when pain or some other reason indicates the necessity of a visit to the dentist, the only form of treatment which is considered, or which is acceptable, is, in a very large number of cases, the extraction of the offending teeth.

DENTAL SERVICES OF GREAT BRITAIN

Dental service can be had in a variety of ways, in Great Britain, apart from that provided by private practitioners. More than 3,000 maternity and child welfare clinics and 1,600 antenatal clinics in England and Wales provide dental treatment. Under the school medical service, there are the equivalent of 705 full-time dentists and more than 1,500 dental clinics. Treatment is available at dental hospitals and in the out-patient departments of most general hospitals, and in municipal clinics. Public assistance committees generally have arrangements for giving treatment. Finally, dental service is given as an additional benefit under the National Health Insurance Scheme. Various charitable organizations give aid to people who come under none of the services mentioned above.

SCHOOL DENTAL SERVICE

In January 1936, the Board of Education, in a circular to local authorities, stated:

> The School Dental Service is seriously incomplete in most parts of the country. Authorities should aim at securing an initial dental inspection of every child on its entry into school life, to be followed by an annual re-examination until the child ceases to attend school. On this basis the Board estimates that, with a normal number of acceptances for treatment, a minimum standard

should consist of one dentist for 5,000 children in an urban area and 4,000 children in a rural area, although this is insufficient where a high percentage of parents accept treatment for their children.

In 1935, in England and Wales, 3,366,818 elementary school children out of 4,748,453 were dentally inspected, and 2,290,404 were found to require treatment, but only 64.4 per cent of these actually received it. The time spent by school dentists on this work amounted to the equivalent of the work of one full-time dentist on 7,600 children.

In Scotland, the situation is worse than in England and Wales. Only 215,564 children out of 633,284 were examined in 1936. The number of dentists working whole time was fifty-one, and part time thirty-five, which is the equivalent of one dentist for every 12,000 on the school register.

DENTAL BENEFIT UNDER THE NATIONAL HEALTH INSURANCE SCHEME

The dental benefit is the most important of the additional treatment benefits which can be offered by an approved society. But a contributor is only entitled to receive additional treatment benefits after he has been a member of the society for, on an average, two and a half years. As a result, the gap between the dental supervision obtained at school and that obtained under national health insurance is prolonged for those who do not come under the insurance plan until they are nearly nineteen. But under the National Health Insurance (Juvenile Contributors and Young Persons) Bill, the period during which a person is a juvenile contributor will count toward qualification for additional treatment benefits. The Dental Benefit Council, which is set up under the Dental Benefit Regulations, is responsible for making arrangements for securing to those members of societies who are entitled to dental benefit satisfactory dental treatment and for exercising, subject to the general responsibility of the Minister of Health and the Secretary of State for Scotland, supervision over the administration of the benefit.

Approved societies must fix a proportion of the cost of dental treatment, and where the cost is under 10 shillings, the society must pay the whole. There is no panel of insurance dentists: members are free to go to any dentists who agree to provide treatment under the conditions laid down by the Dental Benefit Regulations, except when the dentist has been declared unsuitable for service in connection with dental benefit following an inquiry by the central department. A maximum scale of fees, which the dentist must not exceed, is prescribed in the regulations.

In 1927, the Ministry of Health set up a service of regional dental officers to assist the societies when doubt arose as to particular cases. If any disagreement arises between a dentist and a society as to whether there has been any failure on the part of either dentist or society to abide by the regulations, a referee and a dental assessor may be appointed by the Dental Benefit Council to hold an inquiry. Appeal beyond the referee may be made to an appeals committee. If the council considers that there is a *prima facie* case for holding an inquiry as to whether a dentist is unsuitable for service in connection with dental benefit, they may make a representation to the minister of health or the secretary of state for Scotland, who may order such an inquiry.

OTHER DENTAL SERVICES

There are large numbers of insured workers whose societies do not pay dental benefits and many millions of uninsured people who may require dental treatment. Families dependent on public assistance committees may apply to the relieving officer for a "dental letter," and

thus obtain treatment or dentures free of charge. In fact, extractions only seem to be dealt with in this way, and no preventive work is done.

Many voluntary hospitals have dental clinics to which admission is either free or by letter or recommendation. A few hospitals treat only people who are already their patients. The charge for dentures is usually about £4 or £5, and the amount to be paid by the patient is decided by the almoner if one is employed. In two London boroughs, municipal clinics are provided and charges varying with means are levied.

Voluntary insurance is playing an increasingly important part in providing for hospital treatment, and, incidentally, for dental treatment in Great Britain. One of these affiliated schemes, the Hospital Savings Association, has a membership of one and one-half millions, mostly in Greater London. Benefit is always confined in these cases to the actual subscriber. Nor do these schemes always carry the whole cost of treatment and the supplying of dentures.

COST OF EXTENDING DENTAL BENEFITS

It is generally agreed that much ill-health is due to lack of dental care, and an extension of this service would in the long run undoubtedly cause substantial savings in other directions. In 1937, 13,000,000 people in Great Britain belonged to societies which give dental benefits, but, in most cases, members have to find half the cost themselves, and thus many do not get adequate care.

The experiences of the approved societies give little indication of the cost of a full dental service for all insured persons, since, if dental benefit became a statutory benefit, it would be much more commonly used, although, after arrears had been made up, each individual treatment would probably be much less serious than at present.

The Royal Commission estimated that the cost per case treated would be in the initial stages at least as high as £4 per year, since there would be a heavy demand for dentures, and they suggested that 5 per cent of the insured population might be expected to apply for treatment annually. On this basis, the cost would be 4 shillings per head. The estimated total cost of providing for various groups would be: insured population, 1936, 19,000,000, £3,800,000; employed juveniles (14-16), 1,000,000, £200,000; independent workers, 1,000,000, £200,000.

These estimates would probably be exceeded during the first year of the scheme as from 60 to 80 per cent of insured persons would need treatment.

Without detailed inquiries into the sex and age distribution of persons with dental defects, it is impossible to make any accurate estimate of the number of persons who would require dental treatment if it were extended to the dependents of the existing insured class. If we could assume that the incidence of dental defects among the dependents of insured persons is not greater than that among the insured class, it would cost another £3,000,000 to include the dependents of insured workers in the scheme.

Approved societies allocate £2,473,000 to dental benefit at the present time. Since this is from surpluses, if sickness rates should increase and interest rates fall, the surpluses might be diminished.

Those who signed the majority report of the Royal Commission in 1926 considered that even if a complete dental service could not be introduced, a restricted scheme including all insured persons could be created. For example, conservative and operative treatment might be made a statutory benefit. But insured persons would still have to contribute toward the cost of dentures. In practice, such a distinction would be difficult.

DENTAL CARIES IN AMERICAN INDIAN CHILDREN*

THOSE peoples that are removed from civilizing influences generally show less prevalence of dental caries. The American Indians have been in close contact with civilized white people for many years. They are particularly appropriate for studies on epidemiologic characteristics of dental caries because of their wide geographic distribution and because of the differences which exist between the tribal groups in physical constitution, habits and customs.

The material upon which the present analysis is based consists of records of dental examinations of 8,257 American Indian school children. The children were approximately equally divided by sex. Their ages ranged from 6 to 19 years, with a small number above and a very few below this range. They were distributed among seventy-six Indian reservations located in sixteen states. Thirty-five tribes, in which a minimum of twenty-five or more children were examined, are arranged in six major locality groups, the southwestern consisting of the Apache, Cocopah, Havasupai, Mission, Mohave, Navajo, Papago, Pueblo, Walapai and Yuma tribes; the northwestern, of the Lummi, Makah, Quileute, Skagit, Snohomish and Yakima tribes; the northern lake and forest group, of the Arcikaree, Assiniboine, Blackfeet, Chippewa, Cree and Menominee tribes; the plains locality, of the Bannock, Cheyenne, Gros Ventre, Otoe, Pawnee, Piegan, Ponca, Shawnee, Shoshone and Sioux tribes; the eastern, of the North Carolina Cherokee, and the southern, of one tribe, the Choctaw, of Mississippi.

The mouth examinations, made with dental mirrors and explorers, included recordings of the slightest degree of caries. The fact that practically all the observations were made by a single observer renders the material particularly valuable for analysis, since one observer examining all tribes contributes considerably to the homogeneity of the collected material. Only the data for thirty-five tribes, in which twenty-five or more children were examined per tribe, are used for purposes of separate detailed analysis.

In order to determine dental caries prevalence, filled teeth and missing teeth must be accounted for, because the amount of active tooth decay represents only a part of the caries experience of individuals under dental examination at a particular time. This survey analyzes the data upon the above-mentioned basis and only for permanent teeth.

As a result of such calculations, it is indicated that the percentage of children having one or more decayed, missing or filled teeth increases with increasing age in each of the tribes and in each of the locality groups, reaching maximums generally at the last chronologic age studied. This general characteristic has been noted also in white people. Marked dissimilarities among the tribes, however, are apparent in the rate of increase in the prevalence of caries with increasing age. It is most rapid for the northwestern tribes and least rapid for certain of the southwestern tribes. The Southwestern Indians in the aggregate have the lowest percentage of children in each

*Abstracted by the Economics Committee of the American Dental Association from an article by Henry Klein and Carroll E. Palmer in U. S. Public Health Service Bulletin 239.

age group affected by one or more decayed, missing or filled teeth, 74 per cent of the children being free of evidence of caries. In this area, the Navajo Tribe is outstanding in that at each age there is the lowest percentage of children having one or more carious permanent teeth. The Walapai children, in Arizona, have higher percentages presenting decayed, missing or filled teeth at each age than the average of all the Southwestern Indians, and are, therefore, unusual for this locality.

The Northwestern Indians, in sharp contrast to the southwestern tribes, are all characterized by exceedingly high caries rates. In one tribe in Washington, at each age from 10 to 16 and over, from 90 to 100 per cent of the examined children are affected by caries.

The Northern Lake Tribes have about average prevalence rates. The Southern Indians, in Mississippi and North Carolina, have high caries prevalence rates.

In an effort to determine why the prescribed difference in caries rates exist, a study was made of various environmental and dietary conditions. The tribes living in the northwest, with the highest caries rates, have available the least amount of annual sunshine and the greatest annual number of days of dense fog, living at or about sea level. In the northern lake and forest group and southern tribes, which also have high caries rates, the conditions were somewhat similar.

The southwestern tribes which have lowest caries rates live in areas of relatively high altitude, where there is available the greatest amount of annual sunshine. These marked differences are very interesting, although they are not proof that climatic conditions have any effect on the extent of caries.

The dietary information is not complete, but a few observations can be made. The Navajo Indians, outstandingly low in caries prevalence, consume considerable amounts of milk and meat protein, the other tribes in the southwest taking larger proportions of agricultural foods, beans, cactus, corn and melons. The northern lake and forest Indians, particularly the more eastern Chippewa and Menominee, consume a vegetarian diet, with small amounts of meats, very little milk and large quantities of wild rice. The Chippewas in North Dakota consume more milk than their eastern tribe members.

In the southwestern geographic area, all tribes are exposed to conditions which seem to be more favorable from the standpoint of dental health.

The diet of the northwest tribes is that of a coastal people.

The southwestern area, which has the lowest caries rates of all the areas studied, is in general an endemic fluorosis area. Fluorides are well known as enzyme inhibitors, and it may be suggested that perhaps a measure of the responsibility for low caries rates in the southwestern area may be the result of the drinking of fluoride waters. Such water may provide an enzyme inhibitor which will operate to limit the chemical degradation of tooth impacted carbohydrates to organic acids, so reducing the production of local acidity about the teeth, and so limiting an important vector in caries initiation. Support for this concept is discernible in the literature.

The speculative character of the foregoing discussion indicates that the question of why such remarkable differences exist in the prevalence of caries among the Indian tribes remains essentially unanswered. However, it is quite well established that such differences do exist. It is probable that combinations of hereditary, dietary or environmental influences plus other factors are the reason for the differences.

Further investigation should be made to establish a basis for the prescribed differences. If the same difference exists

among white people in similar regions, such findings would indicate that peculiarities of localities, not entirely related to the population itself, but to the environment, may determine the degree of caries susceptibility. The fluoride concept mentioned previously also warrants particular investigation.

GROUP HOSPITALIZATION*

THE movement for group purchase of hospital facilities has developed most rapidly since 1931. It was unquestionably given great impetus by the economic conditions that have prevailed during the past six years. During this period, the hospitals were faced with a great decrease in income from philanthropic sources and, at the same time, they had fixed costs, which were gradually pushing them into bankruptcy. The establishment of a group hospitalization plan seemed to be an ideal answer to their problem. Group payment plans have existed in industry, labor unions and fraternal societies for a considerable time. Group hospitalization has an appeal to the public because it is businesslike and carries no suggestion of a request for contributions.

The first plan was initiated in 1918, in Grinnell, Iowa, and is still in operation on the same scale. However, many of the plans proposed and placed in operation in the past few years have failed. A number of the first plans were commercial, organized for profit, and did not function upon a sound financial basis. Furthermore, many of them had objectionable features of lay control over the services which were to be rendered. Opposition of the medical societies to such plans was based upon sound criticism and, over a period of years, the plan which is based upon noncommercial motives and sound insurance practice and has responsible administrators has gained prevalence.

Generally, the group hospitalization contract offers the participant twenty-one days of hospital service with a discount of twenty-five per cent after twenty-one days. Hospital benefits include bed and board in semiprivate rooms; the use of the operating room; the services of the anesthetist, if "a salaried employee of the hospital," general nursing care; routine medication; ordinary surgical dressings, and routine laboratory services. Some offer certain special benefits as sales features and others offer medical services such as x-ray examination, urinalysis, the services of an interne and the resident staff and physical therapy. When more than one hospital participates in the plan in a particular city, a member may obtain service at any one he chooses. An additional benefit that is frequently included in a subscriber's contract is the provision for out-of-town service. If a subscriber becomes sick while traveling, he may be hospitalized in another hospital, and the hospital service corporation of which the subscriber is a member will pay a certain sum per patient per day to the out-of-town hospital. The number of days is usually limited by the contract, usually being less than the number of days allowed in a member hospital.

There are numerous limitations which a casual reading of the contract may not disclose. No provision for hospitalization for conditions which exist at the time

*Summary of a report, "Group Hospitalization," prepared by the Bureau of Medical Economics of the American Medical Association.

of application is an example of these conditions and there is a list of conditions for which hospitalization is not permitted.

Membership often is restricted to employed groups of persons when the plan is first promoted. It is usually extended to dependents of group members and ultimately to individuals and their dependents. Although the plan is ostensibly for the benefit of lower income groups, in only one case is the income level a criterion of membership.

As of January 1, 1937, there were sixty plans in operation, with a total known membership of approximately 700,000, consisting of 450,000 subscribers and 250,000 dependents. The increase in 1937 was undoubtedly great, since 400,000 new members were included in 1936. There is a definite tendency toward concentration of membership in a few large plans. One significant fact is that the plans have so far failed to include the persons in the low income groups or those in rural areas. Lowering of the premium rate and liberalization of benefits may accomplish this.

The plan is based on the expectancy that each member will be sick on the average of one day a year or, to put it another way, 10 per cent of the members will be hospitalized in one year for an average stay of ten days. The hospitalization experience has indicated that members are hospitalized twice as frequently as members of the general population. This is offset somewhat by the fact that the period of stay is somewhat shorter than in the general population. However, if the number of members continues to increase, and there is not any increase in the prevention of disease, it may be that hospitals will be so cluttered up with persons with insignificant ailments that good medical and hospital services will suffer.

The inclusion of medical service in group hospitalization contracts is of great concern to the medical profession. There is a possibility that this tendency might increase and result in destruction of professional control over hospital and medical practice. To eliminate this practice and prevent the extension of such services, every contract should clearly state that only bed and board, use of the operating room and the delivery room, surgical dressings and ordinary medication are included. Likewise, the contract should specify that anything that can be construed as a professional service should not be included.

THE DENTAL HEATH PLAN ILLEGAL*

THE May issue of the *Journal of the Second District Dental Society* contains a report by one of its members on an organization presenting what is known as "The Dental Health Plan" recently started in New York City.

From a reading of the contract, it appears that the plan in general is as follows:

Any one who wishes to become a member must have an average weekly income of $30.00 or less and be accepted by the association. The cost of membership is $10.00 a year, or $10.25 when paid in installments. This sum entitles a member to the following dental services:

(a) One full mouth x-ray series and all other necessary pictures.

(b) Two prophylaxes a year.

*Briefed by the Economics Committee of the American Dental Association.

(c) All necessary amalgam fillings.
(d) All necessary silicate.
(e) All necessary gingivitis treatments. (Does not include Vincent's infection.)
(f) All necessary exodontia.
(g) All necessary root-canal therapy.

If, in the opinion of the dentist treating the member, the services of an exodontist are needed, arrangements for said services will be made, at the expense of the association and without charge to the members.

It is stated that nothing contained in this plan shall interfere with the customary confidential relationship between dentist and patient. Of the $10.00 paid by the member for these services, the dentist associates receive $5.50. For this sum, they agree to provide either one or all of the above-mentioned services, depending on the patients need.

Dentists become associated with this dental health plan by agreeing to do work upon this basis and signing a contract to that effect, which can be terminated by thirty days' notice on the part of either party to the contract.

All dentists who become so bound are placed on the health plan list and a member may go to any one of the dentists on the list for services under the plan.

The fee scale for dental work not included in the agreement is:

(a) Full denture with Solila or Trubyte teeth	$20.00
(b) Partial denture (plus $3.60 for each gold clasp or lug)	20.00
(c) Lingual bar, complete	35.00
(d) Palatal bar, complete	35.00
(e) Bridges	7.00
Per unit for soldered facing,	$10.00.
Per unit for cast Steele or tube teeth.	
(f) Gold shell crown	7.00
(g) Inlays	10.00
For an M.O.D.,	$8.00.
(h) Gold cast crown	10.00
(i) Porcelain jacket	20.00
(j) Davis crown	8.00
(k) Vulcanite repair	2.00
(l) All partial castings of non-precious metal shall be charged for at the rate of	$15.00 more than if the case were made entirely of vulcanite.

The dentists are not allowed to charge members any more than the foregoing prices, but they are allowed to retain all the fees collected for this work and, under the terms of the contract, the association assumes no responsibility and none of the cost of the work.

The dentist must also carry malpractice insurance with a reputable and reliable insurance company; agree to permit the use of his name on all literature, circulars and pamphlets prepared by the association, and file a complete report on a form furnished by the association within forty-eight hours after services are completed.

Information about this plan including a list of the dentists associated with it was turned over to the Grievance Committee of the State Board of Dental Examiners of New York. The Board warned all the men so involved that the entire procedure is illegal and that unless they discontinue their activities immediately, they would be brought under charges before the Grievance Committee sometime in June. Such a plan would appear to be illegal under the New York law regulating the practice of dentistry, because (1) an association is prohibited from practicing dentistry and this association contemplates doing so, (2) a dentist is prohibited from practicing under the name of an association and (3) the advertising of fixed prices for dental services is expressly prohibited by law.

INCIDENTS OF PRACTICE

Retarded Eruption of a Lower First Molar

By H. Martin Berman, D.D.S., Floral Park, N. Y.

I am presenting a most interesting case of retarded eruption occurring in a white boy, aged 14, in good health.

It is not unusual in malocclusion to see bicuspids which are crowded in the arch or which are in a partially erupted state because of a lack of development of the jaw in the mesiodistal direction. In this case, however, a lower right first molar was partially erupted, whereas all else was normal. Only the occlusal surface showed through the gingiva. An occlusal amalgam filling was

Partially erupted lower first molar.

present in the tooth when the patient presented himself for treatment.

Normally, the lower first permanent molar erupts posterior to the second deciduous molar, and supposedly free from hindrance. Yet here the second bicuspid has fully erupted, as has the second molar; but the first molar has failed to reach the line of occlusion, as shown in the illustration. Evidently, the jaw had developed sufficiently in the anteroposterior direction, or there would not have been sufficient space for the second bicuspid and second molar to come into position. Of note is the fact that the lower first molar on the left side was normal in every respect.

The history of the case points to trauma as the cause of this phenomenon. The patient stated that when he was about 7 years of age, he was struck on the right side of the face with a golf club. There seemed to be no other explanation of the cause of the condition.

Orthodontic opinion on the case will be welcomed.

2 Whitney Avenue.

Cast Bridgework

By Joseph Weiss, D.D.S., Milwaukee, Wis.

The principle of physical union or casting gold to gold has been used in dentistry for many years with varying degrees of success. The casting of an occlusal surface to the band in the construction of a crown has been widely and successfully used, whereas the casting of a saddle to a clasp has had quite uncertain results.

In the last few months, I have been using this principle successfully in constructing bridgework. The dummies have been cast directly to the abutments with perfect fusion of metals and even a stronger union than in a soldered joint. This eliminates the casting of separate dummies, dressing them down, realining, investing for soldering and soldering.

The finished product also requires less finishing. It lessens the possibility of any of the teeth slipping out of alinement and eliminates the possibility of a broken soldered joint. The time saved in the construction of a bridge of this type is considerable. In fact, a difficult bridge can be made almost as simple as an inlay.

TECHNIC

The abutment teeth are prepared and the casts are made as usual. The inlays or three-quarter crowns are then placed in the mouth and burnished and the impression for the bridge is taken. Before the cast is poured, it is advisable to flow a thin layer of soft wax on the inside of the inlays, being sure not to cover the margins. This will facilitate the removal of the inlay when it is taken off the model. By keeping the margins clear of wax, a clean margin will be retained which will permit the operator to definitely seat the bridge after it is completed. If one of the abutments is a crown, wax is placed only on the inside of the crown, the occlusal surface and gingival margin remaining clear. Then the model is poured, and, when it has

hardened, the casts are lifted off and the wax is removed from the inner surfaces of the inlays or three-quarter crowns, and these are reseated.

If this is not done, a small unnoticed particle of wax on the margin may permit the flowing of the gold on the inner surface and ruin it. Sometimes even the high heat of the investment and the force of the molten gold may melt a thin portion of the abutment, permitting the gold to flow into the space formerly occupied by this excess wax.

After the model is made, the wax is removed and the abutment crown or inlay is reseated and the teeth are ground in, the dummies waxed up and the teeth occluded.

The pontics are now seared together firmly and completely, the dummies removed and the inlays lifted out. Next, a very thin layer of sticky wax is melted on the mesial or distal surface of the crown or inlay where it comes in contact with the pontics, then it is reseated and seared to the abutments. The blue wax of the pontic will stick more readily to the sticky wax melted on the gold than it would to the gold itself.

The case is now ready for spruing. This is an important factor in the success of the bridge. A sprue must be placed at every joint wherever the dummy is to unite with the inlay. If the sprue pin is placed any distance away, the gold may cool off very slightly, just enough to prevent a perfect union. If three teeth or more are being replaced I suggest a third sprue, placed toward the center of the case. Two air vents would also be advisable to permit the escape of gasses. For a sprue pin, I use a long bur, cut off at the point where it begins to taper.

The case is now ready to invest for casting. The ring should have an asbestos lining, and a heavy mix of Steele's investment and warm water should be used. This will permit a maximum of expansion. The investment is then heated in the furnace to about 1,400 degrees. At this point, through the sprue hole, in the ordinary light of the laboratory, a red hot glow can be seen emanating.

The gold is now placed in the crucible and after it becomes very hot, the ring is quickly placed in the casting machine, and the gold cast as soon as possible. The ring should not be allowed to cool off before casting. After casting, the piece is permitted to cool off slowly and pickled in hydrochloric acid. The result will be a perfect occlusion with no necessity of removing excess solder and requiring very little finishing and the bridge can be seated perfectly.

611 Caswell Building.

A Tooth Within a Tooth: Report of a Case

By H. James Harpole,* D.D.S., Atlanta, Ga.

A man, aged 20, colored, reported to the college clinic, January 19, 1938, with a swelling involving the palate of the right side of the maxilla. This area was soft and crepitation occurred when the parts were palpated.

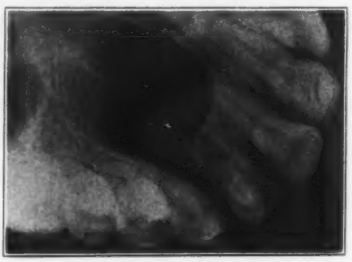

Fig. 1.—Tooth in position.

The patient stated that the swelling had been present for about a year and that he was aware of some increase in its size.

At times, there was a slight drainage of bloody pus from around the lingual side of the necks of the upper right anterior teeth. Pain was felt just before the escape of this fluid and was described as a dull, throbbing ache that lasted for a day or two. The teeth had no cavities and were normal with the exception of an abnormal enlargement of the right lateral incisor. Occlusal roentgenograms were made and the patient was told to return the following day. (Fig. 1.)

On examination, the roentgenograms showed a definite cyst on the right side of the maxilla involving the central, lateral and cuspid teeth. Within the pulp chamber of the lateral incisor, there appeared to be a supernumerary tooth, which seemed to be

*Associate professor of oral surgery, Atlanta-Southern Dental College.

inverted and appeared to contain a pulp canal. (Fig. 2.) The right lateral incisor was larger than the left lateral and its pulp canal was extremely dilated.

January 20, 1938, an incision was made

Fig. 2.—Occlusal roentgenogram of removed lateral incisor.

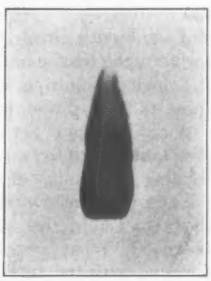

Fig. 3.—Appearance of opened lateral incisor, showing tooth within pulp chamber.

Fig. 4.—Dissected lateral incisor, showing supernumerary tooth in pulp chamber.

under local anesthesia. The mucoperiosteum was turned back and the exposed bluish cyst sac was dissected out, a clean smooth cavity remaining. The upper right central and lateral incisor and cuspid were then removed; the flap was sutured, and the cavity was packed with iodoform gauze.

When the lateral incisor was opened, a tooth was found within its pulp chamber. (Fig. 3.) This supernumerary tooth measured 11.5 mm. in length and 4 mm. in width.

Condensing Osteitis of the Mandible: Report of a Case

By J. N. Friedlander, D.D.S., Lynbrook, N. Y.

A woman, aged 27, white, who had undergone appendectomy, at the present time was subject to gallbladder attacks. A cholecystectomy has been advised.

A bridge was present from the lower right second molar to the first bicuspid. There was a full crown on the former and a three-quarter crown on the latter. A pontic was

Fig. 1.—Condensing osteitis of mandible.

swung off the bicuspid to supply a missing cuspid. The lower right bicuspid was vital. (Fig. 1.)

The alveolar process of the missing cuspid toward the crest of the ridge seemed to be densely compact bone, the area extending from the apex of the bicuspid posteriorly. There were no symptoms of pain nor was any swelling evident.

The sclerotic area may be the result of a residual infection from the second bicuspid; or it may be due to the stress placed on the first bicuspid as a bridge abutment tooth, which resulted in a chronic inflammation of the bone.

Kronfeld states such sclerotic areas will not clear up with the removal of the irritating factors. He believes the danger from such areas is overemphasized.

141 Hempstead Avenue.

CURRENT LITERATURE

Case of Complete Absence of Permanent Dentition

By V. C. Warr

A boy, aged 12 years, was apparently normal in all respects except for complete absence of the permanent teeth. He had very good health. His parents were first cousins, but there was no history of any dental peculiarities on either side of the family, as far as can be ascertained. $\frac{B}{} \mid \frac{B}{}$ were also congenitally absent.

Roentgenograms revealed almost complete resorption of $\frac{A}{} \mid \frac{A}{D}$, partial resorption of the roots of $\frac{D}{E} \frac{}{CBA} \mid \frac{D}{ABC} \frac{}{E}$ and no resorption of $\frac{E}{E} \frac{C}{C} \mid \frac{C}{C} \frac{E}{E}$. The antra were abnormally large and in the $\frac{6}{} \mid \frac{6}{}$ regions extended almost to the margin of the bone. The crowns of $\frac{C}{BA} \frac{A}{} \mid \frac{A}{AB} \frac{C}{}$ were considerably worn.

The patient was of good appearance except that the bite was a little too close, this tending to make the distance between the nose and chin disproportionately short.—*Brit. D. J.*, 64:327, March 15, 1938.

Biting Lips and Cheeks

The habit of biting the lips and cheek is decidedly dangerous and should not be allowed to continue. The continuous irritation produced in this way may set up serious pathologic conditions. The first step in the consideration of such a case should be the construction of accurate plaster or stone models made from plaster impressions of the dentures. A careful study of these may show conditions that invite the execution of the habit. Judicious grinding of the teeth may make the execution of the habit difficult enough to effect a cure.

Such lip and cheek biting is often to be considered as a nervous habit and should be corrected under the advice of a neurologist. Such habits are unconsciously executed and sometimes they can be cured by consciously executing them before a mirror regularly every day for a time, the object being to bring the muscles and nerve tracts involved in the execution of the habit under conscious control and thereby break up the unconscious execution. If no other method is available, probably removable appliances should be made that can be worn on the teeth so as to make the execution of the habit impossible. These could be made only for the individual patient and by a skilful dentist. They should be used only as a means of breaking the habit.—Queries and Minor Notes, *J. A. M. A.*, 110:1303, April 16, 1938.

Chronic Recurrent Canker Sores

Question: A woman, aged 25, complains of canker sores of the mouth, involving the lips, the buccal surfaces, the tongue and the gums. These may be single or multiple and vary in size from 2 mm. to 8 or 10 mm. in diameter. They occur sporadically and are quite painful. The silver nitrate cautery relieves the pain, and healing occurs in approximately two weeks. They have been present for at least fifteen years. Could this be a purely local phenomenon? What systemic conditions are associated with lesions of this type? There is no anemia. Elimination diets have proved ineffective. Supplementary vitamin therapy has also failed.

Answer: Although canker sores, or aphthae, were first described by Hippocrates 400 years before the birth of Christ, accurate knowledge concerning them is still very meager. These lesions are a maculofibrinous stomatitis and the case described would seem to fall into one of two groups: (1) habitual aphthae or (2) chronic intermittent aphthae.

1. Habitual aphthae constitute the dyspeptic canker sore and have been thought by some workers to be a low grade infection and by others have been considered allergic. Deficiency of vitamin B has been mentioned as a possible cause. The fact that dietetic treatment and vitamin therapy have failed to be effective in this case would seem to place it outside this group; but the allergic

possibilities should be thoroughly worked out before a definite decision is made.

2. Chronic intermittent recurrent aphthae were first described by Mikulicz in 1888 and have been called Mikulicz's aphthae. This disease occurs primarily in women and not infrequently has its onset at the time menstruation begins. It tends to recur at intervals of from four to six weeks and the lesions are quite compatible with those described in this case. Nothing definite is known concerning the etiology. Many theories have been advanced, but up to the present time all of them are purely speculative. No specific treatment is known. Local treatment with 5 per cent chromic acid solution or with alum or silver nitrate is recommended. It is not wise to allow the patient to use the silver nitrate stick because crater-like scars may result.

Occasionally dermatitis herpetiformis will produce lesions on the mucous membrane of the mouth, but the associated lesions of the skin serve to make the diagnosis.

It would seem that the fifteen years' duration would fairly well rule out serious systemic disease and would be a powerful argument in favor of considering this as a local phenomenon, probably a case of Mikulicz's aphthae.—Queries and Minor Notes, *J. A. M. A.*, 110:1212, April 9, 1938.

Kirschner Traction in the Treatment of Maxillary Fracture

By Glen Major

The fact that numerous technics have been perfected for the treatment of maxillary fractures implies that no appliance readily adapts itself to the treatment of all types of maxillary fracture. Before a satisfactory method of reduction can be selected, the position of the fragments must be considered. A high percentage of fractures of the upper jaw are compound, and complicated by fracture of the skull through the anterior cranial fossa. One must consider too, the possibility of intracranial infection. Hence, the patient should be treated very conservatively, for at least one week, by immobilization of the maxilla with a head-chin bandage, and by spraying the nose with an antiseptic solution at frequent intervals. The author discusses various methods of handling maxillary fractures and describes his technic in detail. He uses the principles of skeletal traction, involving a Kirschner wire. This technic allows gradual and complete reduction of the fracture without discomfort. The apparatus can easily be applied under local anesthesia and there is little danger of additional intracranial injury or infection.—*J. A. M. A.*, 110:1253, April 16, 1938.

M. K. Hine.

Workmen's Compensation Acts: Bell's Palsy a Compensable Injury

The claimant was employed as a saleswoman by the defendant department store. While she was showing coats to a customer, a fellow employee switched on an electric fan and subjected the claimant to a sudden draft. Bell's palsy resulted and the claimant filed a claim for an award under the workmen's compensation act of New York. A disallowance of the claim by the state industrial board was affirmed by the supreme court, appellate division, and the claimant appealed to the Court of Appeals of New York.

In this case, said the court, the claimant was struck by air propelled by an electric fan. The result was "palsy which is limited to one side of the face and is acute in onset and called Bell's." There was a consequent distortion of the parts and of the powers of expression. In the opinion of the court, the average man would say that so swift and harsh a disablement was an accidental injury when it was so strangely suffered in the ordinary day's work. It seemed to the court that analogy, too, leads to that conclusion. "Sunstroke, strictly speaking, is a disease, but the suddenness of its approach and its catastrophic nature have caused it to be classified as an accident." The order of the supreme court, appellate division, and the determination of the state industrial board denying compensation, were therefore reversed.—Medicolegal Abstracts, *J. A. M. A.*, 110:1139, April 2, 1938.

Leukoplakia Buccalis

By F. J. Eichenlaub

Among 16,802 veterans examined, 327 (1.9 per cent) had leukoplakia. The average age was about 40 and less than 5 per cent of those examined were negroes. Of the

lesions, 217 were on the buccal mucosa, thirty-eight on the lips, eight on the tongue, three on the gums, two on the palate and the remainder in two or more areas (forty-one) or the site given only as the mouth (eighteen). Of those examined, 83.7 per cent used tobacco (forty-eight, pipes; eighteen, cigars; 203, cigarets; seven, chewing tobacco). Only five patients stated that they did not use tobacco. Thirty-three (10 per cent) had a definite diagnosis of syphilis and about the same number a possible history of syphilis against 3.6 per cent for the entire group. In 11.9 per cent, tuberculosis was diagnosed as against 14.3 per cent for the entire group. There was a slightly higher incidence of dental disease in the leukoplakia group and about 20 per cent more infection of the nose, throat, ears or respiratory tract.

In the entire 16,802 patients, carcinoma of the lip was seen in nineteen, of the cheek in one and of the larynx in six. In three lip and one buccal cancer, leukoplakia was present and four of the six with laryngeal cancer had oral leukoplakia. Although this does not indicate that leukoplakia is precancerous, the author believes that the age of this group is a factor and, at a later age, different conditions might be found. Apparently, leukoplakia is not caused by any constitutional disease, only 20 per cent showing any evidence of syphilis, but rather is a result of hyperkeratosis following irritation.—*Arch. Derm. & Syph.*, 37:590, April 1938.

HAMILTON ROBINSON.

The Public and the Cancer Problem

By JAMES EWING

PUBLIC interest in cancer is at the highest point in history, yet no adequate popular treatise on cancer has been produced and many preposterous tales about cancer are being disseminated. The American Society for the Control of Cancer has been instrumental in spreading knowledge of the facts of cancer and in stressing warning signs and the importance of early diagnosis. In tumor centers, study is being carried on through cooperation of the representatives of the branches of medicine and the many sciences. In spite of the present status of knowledge, many are led to believe that cancer is a disease entity and discovery of the cause will lead to discovery of the cure. While the investigations on cancer have been made possible through large grants from philanthropists, many such funds are being misplaced through ignorance. Advances in the study of tumors have been made through the work of men with a broad foundation who have labored for years on well conceived and skilfully executed researches. Fundamental cancer research has indicated many possible causes of cancers and has aided the cancer patient. The advice that Dr. Ewing gives the physician might well be heeded by the dentist: "He should be cancer conscious and alert to detect the early signs of the disease in his patients, taking nothing for granted. He should maintain his education by constant reading and faithful attendance at meetings, and should cultivate a progressive attitude toward modern organization of service and methods of treatment. In treatment of cancer, he should employ his talents, but recognize his limitations and the necessity of special skill in special fields."—*Science*, 87:399, May 6, 1938.

HAMILTON ROBINSON.

Additional Clinical Investigations with Divinyl Ether as An Anesthetic Agent in 1,882 Cases

By E. BEACH

DIVINYL ether was used as the anesthetic of choice in ophthalmology, otolaryngology and oral surgery operations. Regarding the oral surgery findings, the author reports that the induction period lasts from thirty to fifty seconds. The degree of anoxemia is slight and there is good muscular relaxation. The recovery period is somewhat longer than that of nitrous oxide anesthesia and adults complain more often of momentary postoperative headache. The absence of loss of control of the bladder is a particularly gratifying finding. All administrations were by the open-mask method.—*Anes. & Anal.*, 17:90, 1938.

J. F. VOLKER.

Effect of General, Local and Intravenous Anesthetics on Experimental Electrocardiograms

By H. WIDENHORN, I. VALINI and R. MCLAUGHLIN

A COMPARISON of the effect of general, local and intravenous anesthesia on the elec-

trocardiograms of experimental animals was made. The general anesthetics tested were ether and chloroform. Avertin, nembutal, sodium amytal and evipal were represented in the intravenous group, and 1 per cent procaine was the local anesthetic. There was no significant change in the electrocardiogram when from eight to ten times the normal dosage for human beings was administered to the experimental animal by local infiltration. Administration of all the other anaesthetics, general and intravenous, caused deviations in the electrocardiograms.—*Anes. & Anal.*, 17:93, 1938.

J. F. Volker.

Examination of the Mouths of Eskimos in the Canadian Eastern Arctic

By C. S. McEuen

In the oral findings in 106 Eskimos of the Canadian Eastern Arctic, twenty-six had teeth missing, only three having more than five extracted. This is significant since their ages range up to 65. The low incidence of caries is equally striking. Only nine persons gave evidence of caries and only one had more than one cavity. Pyorrhea was present in sixteen mouths, being particularly common in the Wolstenholme area. Seven mouths had sordes (oral débris and filth). The diets varied from a purely native one of meat to one that included some starches and sugar. The author attributes this healthy oral condition to the lack of carbohydrates in the diet and to the constant use of the teeth in chewing coarse foods.—*Canad. M. A. J.*, 38:374, April 1938.

S. B. Finn.

Formation of the Organic Substrate of the Fundamental Substance of Dentine

By Jorge Erausquin

This paper is a study of (1) the formation of the fibers of the fundamental substrate of the dentin in tooth roots, (2) formation of the fibers of the fundamental substrate of the dentin in incisors of rodents, (3) general considerations about the differentiation of the tiny fibrils of the dentinal substrate, (4) secretory phenomena in the odontoblasts, (5) the appearance of the amorphous substance in the dentinoid zone and (6) special aspects of the process, giving technics employed: investigation of the (a) fibrillar branches, (b) amorphous substance and (c) protoplasmatic elements. The author gives quite a complete bibliography of the subject. The conclusions are as follows:

1. The organic substrate of the fundamental substance of dentin is made up of (a) branched fibrils and (b) a homogeneous cement.

2. The fibrillar branch, generally precollagenous, is the first of the components of dentin that appear differentiated. It has not been possible to find fibril elements originated posterior to the deposit of the amorphous substance.

3. Although, in some species, the fibril branch continues, being abundant during the later development of the follicle, in others it diminishes in such form that it is impossible to consider it the principal component of the organic substrate. In these cases, the greater part of the same would be constituted by homogeneous cement.

4. The origin of the fibril branch is similar to that of the homologous elements of the conjunctive tissue. The organ of the enamel and the sheath of Hertwig would influence its formation, in the sense of regulating its diameter and symmetry. The odontoblasts present in their protoplasm some granules that, united to other cytologic characters, permit a secretory function to be assigned to them. Thus, the agreement between these phenomena and the appearance of homogeneous cement of the dentinoid zone make one suppose that the latter depends, directly or indirectly, on the former.—*Rev. Odontol.*, July-September, 1936.

Martin Deakins.

Further Remarks on the Terminations of Nerves in Human Teeth

By O. Tiegs

In decalcified tangential sections from a human molar, prepared by Bielschowsky's method, the author finds distinct nerve fibers which have end-organs attached to Tomes' fibers in the subdentinal zone. Some pass through this zone to the openings of dentinal tubules, but no farther. Pain must, therefore, be transmitted from the dentinoenamel junction by Tomes' fibers to the nerves of the pulp.—*J. Anat.*, 72:234, 1938.

Martin Deakins.

American Dental Association

St. Louis, Missouri October 24-28, 1938

HOTEL RESERVATIONS

To secure hotel accommodations for the 1938 Session, consult the rate list and fill out the attached blank. Mail this immediately to the hotel of your first choice or to the Housing Committee, Room 108, Hotel Statler, St. Louis, Mo. Confirmation will be sent to you by the hotel.

Second and third choices of hotel should be indicated. If the reservation cannot be made at any of the hotels of your choice, the Housing Committee will place you in as favorable a hotel as possible and will notify you.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely, to occupy the room at the time agreed upon, please write or wire the hotel releasing the room, in order that it may be available for other members.

APPLICATION FOR HOTEL ACCOMMODATIONS

AMERICAN DENTAL ASSOCIATION

St. Louis, Mo. October 24-28, 1938

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HOTEL.....2nd choice

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AMERICAN 6 North 7th St.	$2.50	$4.00	$5.00
AUDITORIUM 1803 Pine St.	2.50	3.50	4.50
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CHASE 212 N. Kingshighway Blvd.	2.50–3.00–3.50–4.00 Apartments (4 persons), 12.00	4.00–5.00–6.00	5.00–6.00
CLARIDGE 18th and Locust St.	2.00–2.50–3.00	4.00–4.50–5.00	4.00–4.50–5.00 6.00
CONGRESS 275 N. Union Blvd.			6.00
DESOTO 1014 Locust St.	2.00–2.50–3.00	3.00–3.50–4.00	3.50–4.00–5.00 6.00
CORONADO 3701 Lindell Blvd.	2.50–3.00–3.50 4.00–4.50–5.00–6.00 Parlors (wall beds), 5.00, single; 6.00, double 2 room suites (3 persons), 7.50 Parlor suites, 5.00 6.00–7.00–8.00–9.00 10.00–11.00–12.00	3.50–4.00–4.50 5.00–6.00	4.00–4.50–5.00 5.50–6.00–7.00
FAIRGROUNDS 3644 Natural Bridge Blvd.	2.00–2.50	3.00–4.00	
FOREST PARK 4910 W. Pine Blvd.	3.00 Apartments (2-4 persons), 3.00 person		4.00–6.00
GATESWORTH 245 Union Blvd.	3.00 Suites (4 persons), 8.00	4.00	5.00

*Extra cot, $1.00. Rates on rooms without bath on request.

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KINGS-WAY 108 N. Kingshighway Blvd.	2.00–2.50–3.00–3.50 Suites, 5.00–6.00–7.00 8.00	3.00–3.50–4.00	4.00–5.00–6.00
LENNOX 825 Washington Ave.	3.00–3.50–4.00	4.50–5.00–5.50 6.00	5.00–5.50–6.00 6.50–7.00
MAJESTIC 200 North 11th St.	3.00	4.00–5.00	6.00
MARK TWAIN 116 North 8th St.	2.00	3.50–4.00–4.50	4.50–5.00–5.50
MARQUETTE 18th and Washington Blvd.		3.00	4.00
MARYLAND 205 North 9th St.	2.50	3.50–4.00	4.00–4.50
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PARKEDGE 4907 W. Pine Blvd.		4.50	6.00
PARK PLAZA 220 N. Kingshighway Blvd.		5.00	6.00
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YORK 8 South 6th St.	2.00–2.50	3.50–4.00	4.50

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

American Dental Association, St. Louis, Mo., October 24-28.

American Academy of Restorative Dentistry, St. Louis, Mo., October 22-23.

American Society for the Advancement of General Anesthesia in Dentistry, New York City, fourth Monday in March and October.

American Society of Orthodontists, Los Angeles, Calif., July 11-14.

American Society of Oral Surgeons and Exodontists, St. Louis, Mo., October 21-22.

American Association of Public Health Dentists, St. Louis, Mo., October 23-24.

Fédération Dentaire Internationale, Paris, July 21-26.

Great Lakes Association of Orthodontists, Cleveland, Ohio, November 7-8.

Pacific Coast Dental Conference, Vancouver, B. C., July 4-8.

Greater New York Dental Meeting, New York City, December 5-9.

District of Columbia Dental Society, second and fourth Tuesdays in each month from October to June at the United States Public Health Service Auditorium, Washington.

American Dental Society of Europe, Stockholm, August 1-3.

Baltimore College of Dental Surgery Alumni, Baltimore, Md., June 1-4.

Northwestern University Dental School Alumni Association, Chicago, Ill., June 8.

Montreal Dental Club Clinic, at Montreal, Canada, October 12-14.

Association of French-Speaking Dentists of North America, Montreal, Canada, June 2-5.

ARPA Internationale, Prague, Czechoslovakia, August 26-28.

American Dental Hygienists' Association, St. Louis, Mo., October 24-28.

American Dental Assistants Association, St. Louis, Mo., October 24-28.

STATE SOCIETIES

June

Colorado, at Estes Park (20-22)

Maine, at Portland (27-28)

Nevada, at Reno (4)

New Hampshire, at North Conway (6-7)

New Mexico, at Carlsbad

South Carolina, at Columbia (13-14)

September

Southern California, at Coronado Beach (12-14)

November

Ohio, at Cleveland

Florida, at Jacksonville (10-12)

STATE BOARDS OF DENTAL EXAMINERS

Alabama, at Birmingham, June 20. James A. Blue, Comer Bldg., Birmingham, Secretary.

Arkansas, at Little Rock, June 20-24. Clarence W. Koch, 817 Donaghey Building, Little Rock, Secretary.

Arizona, at Phoenix, July 18. R. A. McCall, 719 Professional Bldg., Phoenix, Secretary.

California, at Los Angeles, June 20. Kenneth I. Nesbitt, 450 McAllister St., San Francisco, Secretary.

Colorado, at Denver, June 21-25. David J. Tepley, 807 Republic Bldg., Denver, Secretary.

Connecticut, at Hartford, June 21-25. Almond J. Cutting, Southington, Recorder.

Delaware, at Wilmington, July 6-8. Charles R. Jefferis, 409 Medical Arts Bldg., Wilmington, Secretary.

District of Columbia, at Washington, June 20-25. E. Milburn Colvin, Jr., 1726 Eye St., NW, Washington, Secretary.

Florida, at Jacksonville, June 20. H. B. Pattishall, 351 St. James Bldg., Jacksonville, Secretary.

Georgia, at Atlanta, June 6. R. C. Coleman, Secretary.

Idaho, August 2-5. J. L. Balderston, Boise, Commissioner.

Illinois, at Chicago, June 14-17. E. F. Hazell, Springfield, Secretary.

Indiana, at Indianapolis, June 14. J. M. Hale, Mt. Vernon, Secretary.

Iowa, at Iowa City, May 30-June 3. Hardy F. Pool, Mason City, Secretary.

Kansas, at Wichita, June 13-15. Monte Gants, Downs, Secretary.

Kentucky, June 14-17. Robert L. Sprau, 970 Baxter Ave., Louisville, Secretary.

Louisiana, at New Orleans, June 14-18. Joseph L. Webre, Audubon Bldg., New Orleans, Secretary.

Maine, at Augusta, June 23-25. Fred B. Wheaton, 319 Main St., Biddeford, Secretary.

Massachusetts, June 14-17. Francis M. Cahill, 141 State House, Boston, Secretary.

Michigan, at Ann Arbor, June. Charles J. Marcinkiewicz, 672 Fisher Bldg., Detroit, Secretary.

Minnesota, at Minneapolis, June 17-23. Paul Hagen, Crookston, Secretary.

Mississippi, at Jackson, June 21. A. B. Kelly, Yazoo City, Secretary.

Missouri, at Kansas City, June 6-11; at St. Louis, June 8-11. R. R. Rhodes, Jefferson City, Secretary.

Montana, at Helena, July 11. Leonard A. Jenkin, 401 Ford Bldg., Great Falls, Secretary.

Nebraska, at Omaha and Lincoln, June 13-18. Mrs. Clark Perkins, Lincoln, Director.

Nevada, at Reno, June 6. G. C. Steinmiller, Box 274, Reno, Secretary.

New Hampshire, at Manchester, June 27-29. Otis M. Littlefield, Manchester, Secretary.

New Jersey, June 27-July 2. Walter A. Wilson, 148 W. State St., Trenton, Secretary.

New Mexico, at Albuquerque, June 20-24. J. J. Clarke, Artesia, Secretary.

New York, June 27-30; September 19-22. Minor J. Terry, Education Bldg., Albany, Secretary.

North Carolina, at Raleigh, June 27. Wilbert Jackson, Rich Bldg., Clinton, Secretary.

North Dakota, at Fargo, July 11-14. W. E. Cole, Bismarck, Secretary.

Ohio, at Columbus, June 27. Morton H. Jones, 1553½ North Fourth St., Columbus, Secretary.

Oklahoma, at Oklahoma City, June 22-25. W. T. Longwell, Frederick, Secretary.

Oregon, June 7-11. Arthur F. Weeks, Selling Bldg., Portland, Secretary.

Pennsylvania, at Philadelphia and Pittsburgh, June 14-18. W. A. McCready, 1115 Highland Bldg., Pittsburgh, Secretary.

Rhode Island, at Providence, June 28-30. Robert D. Wholey, State Office Bldg., Providence, Chief.

South Carolina, at Columbia, June 9-11. T. C. Sparks, 1508 Washington St., Columbia, Secretary.

South Dakota, at Sioux Falls, June 28-30. H. W. Thomas, Aberdeen, Secretary.

Tennessee, at Memphis, June 13. B. C. Gallimore, Commercial Bank Bldg., McKenzie, Secretary.

Texas, at Houston, June 21-25. B. Carl Holder, Nixon Bldg., Corpus Christi, Secretary.

Utah, at Salt Lake City, June 13-16. Barlow Fox, First National Bank Bldg., Salt Lake City, Secretary.

Vermont, Montpelier, June 27-29. H. B. Small, Burlington, Secretary.

Virginia, at Richmond, June 14. John M. Hughes, 715 Medical Arts Bldg., Richmond, Secretary.

Washington, at Seattle, June 20. Harry C. Huse, Olympia, Secretary.

West Virginia, at Charleston, June 27. Henry C. Hill, Dominion Bldg., Charleston, Secretary.

Wisconsin, at Milwaukee, June 20-24. S. F. Donovan, Tomah, Secretary.

Wyoming, at Cheyenne, June 27-29. P. M. Cunningham, Cheyenne, Secretary.

ARIZONA STATE DENTAL BOARD

The next examination of applicants to practice dentistry in the State of Arizona will be held in Phoenix beginning July 18. Applications must be filed at least fifteen days before the date fixed for the examination. Address all communications to

R. A. McCall, *Secretary,*
719 Professional Bldg.,
Phoenix.

INDIANA STATE BOARD OF DENTAL EXAMINERS

The next examination for licensure of the Indiana State Board of Dental Examiners will be held in Indianapolis beginning June 14. All applications, fees and credentials must be in the hands of the secretary not later than ten days before the beginning date of the examination. For applications, instructions to candidates and other information, address

J. M. Hale, *Secretary,*
Mt. Vernon.

PENNSYLVANIA STATE BOARD OF DENTAL EXAMINERS

The Pennsylvania State Board of Dental Examiners will hold its next examination June 14-18 at Philadelphia and Pittsburgh.

W. A. McCready, *Secretary,*
1115 Highland Bldg.,
Pittsburgh.

STATE OF UTAH DENTAL EXAMINATION

The Utah State Dental Examination will be given at the Department of Registration, 326 State Capitol, Salt Lake City, June 13-16. All applications are to be filed in this office ten days before the examination.

S. W. Golding, *Director,*
Salt Lake City.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS

The twentieth annual meeting of the American Society of Oral Surgeons and Exodontists will be held at the Hotel Jefferson, St. Louis, Mo., October 21-22.

Harry Bear, *Secretary,*
410 Professional Bldg.,
Richmond, Va.

AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTS

The second annual meeting of the American Association of Public Health Dentists will be held October 23-24 in the Daniel Boone Room of the Statler Hotel, St. Louis, Mo. Registration will begin at 9:00 a.m., October 23.

Frank C. Cady, *Secretary,*
U. S. Public Health Service,
Washington, D. C.

NORTHWESTERN UNIVERSITY DENTAL SCHOOL ALUMNI ASSOCIATION

The Northwestern University Dental School Alumni Association will hold its Annual meeting in the Ward Memorial Building, June 8, starting at 9 a. m. The annual golf outing will be held June 9.

George W. Teuscher, *Secretary,*
55 E. Washington St.,
Chicago, Ill.

EXAMINATION FOR APPOINTMENT IN DENTAL CORPS, REGULAR ARMY

An examination for selection of candidates for appointment in the Dental Corps, Regular Army will be held August 15-20 inclusive, at the Walter Reed General Hospital, Washington, D. C.; Fitzsimmons General Hospital, Denver, Colo.; Letterman General Hospital, San Francisco, Calif., and Fort Sam Houston, Texas. The general eligibility requirements for appointment are that the candidate be a citizen of the United States between the ages of 23 and 32 years, be a graduate of an acceptable dental school and be physically fit. Candidates must also have been engaged in the practice of their profession for at least two years subsequent to graduation. Application for authority to take the preliminary examination must be made on the form provided for the purpose, which may be obtained at any military post or station or from the Adjutant General of the Army, Washington, D. C. A circular of information concerning the Dental Corps, scope of the examination and method of making application may be obtained from the Surgeon General, U. S. Army, Washington, D. C. Applications will be received for consideration until August 1, 1938.

RAILROAD FARES TO ST. LOUIS

Because of the reduced regular rates and round-trip fares, there is no longer any arrangement for convention rates and, therefore, there will be no convention certificates available as in the past.

The new low rates for passage in Pullmans and the lower rates for travel in coaches will be in force.

Summer excursion rates will be available from some sections of the country. Inquire of your station agent as to the most economical fare.

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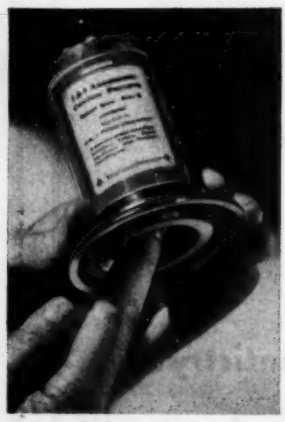

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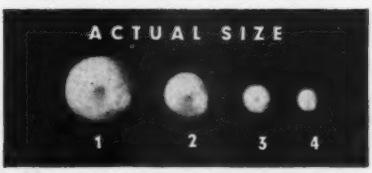

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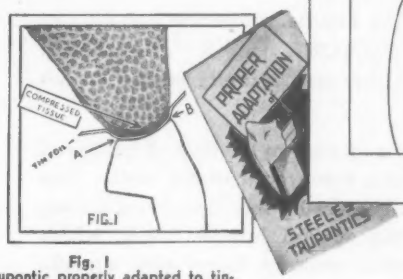

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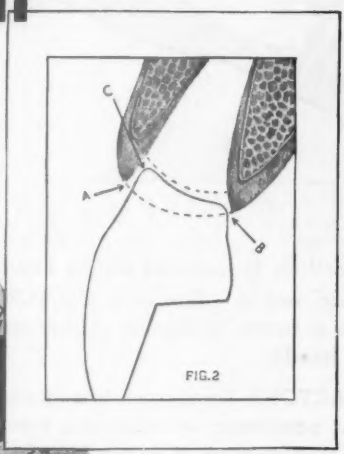

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SAVE TIME AND TROUBLE for the DENTIST

Statements from prominent members of the profession

"By using French's Modified Posteriors in cases where there is a very flat lower jaw I have found it is *much easier* to make a plate to fit the mouth."

"In many cases the force of mastication is difficult to direct inside of lower ridge. The construction of French's Posteriors ***makes it a simple matter*** to so direct this force."

"The correct relation of upper and lower jaw has been and always will be difficult for dentists to obtain in plate or denture work. French's Posteriors *make it easy* to spot grind and correct your misfit on this particular phase of denture work."

"I like Dr. French's Modified Posteriors because of ***the ease*** with which I can obtain bilateral balance."

"Dr. French's Modified Posteriors ***cut down the time and annoyance*** of adjustment. The more perfect articulation and consequent ease of mastication reduce the time in which to get accustomed to the dentures as well as the soreness following insertion of ordinary dentures."

A saving in time for you, greater comfort and efficiency of mastication for your patient — aren't these good reasons for insisting on Dr. French's Modified Posteriors for your next case? . . . Use them with Nuform Anteriors and specify both with a Universal Shade Guide.

UNIVERSAL DENTAL COMPANY · PHILADELPHIA · PA

PERFECTION

THE effort in science as in architecture, painting, literature or whatever the medium through which human aspirations are expressed, is a constant striving towards an ideal which, although it may be impossible of achievement, still remains the goal. . . Our responsibility as manufacturers has impelled us to have our products approach as near perfection as it is possible to bring them. In

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ARISTALOY
INLAY GOLDS
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we feel that we have contributed more than a little to dental progress and should like to tell you about these materials. Shall we do it?

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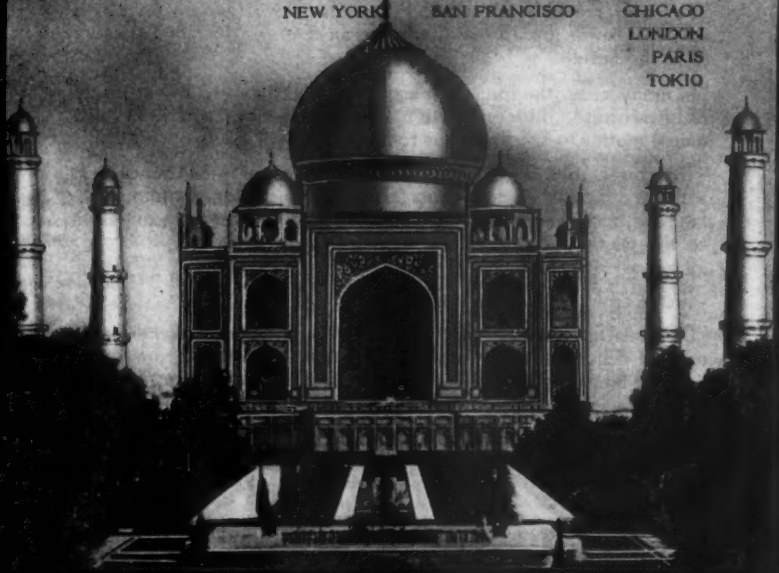
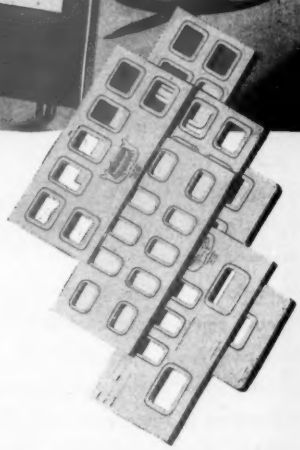


Now—A NEW DENTAL X-RAY ILLUMINATOR

THIS new Eastman Dental Illuminator provides the best possible means of viewing dental radiographs. It is adequate in size (8″ x 10″ viewing area) and constructed entirely of metal... has easily removable blue-tinted, flashed, opal glass... is equipped with 2 spring-clip fingers at top for ready accommodation of every type of dental film mount, as well as occlusal and extra-oral radiographs. Light is evenly diffused and of uniform intensity, closely approximating north daylight—the ideal in quality.

EASTMAN MOUNTS

For convenience in interpreting and safety in filing your radiographs, use Eastman Dental Film Mounts. They are made of sturdy gray bristol board, have unbacked, embossed openings with opaque frames. The radiographs slide easily into slots and are held securely. Twelve types, from single opening to 18 openings, are available.



Ask your regular dental supply dealer to show you the new Eastman Dental Illuminator and the various types of Eastman Dental Film Mounts.

The proper method of mounting and filing radiographs is described in the booklet, "X-rays in Dentistry." A copy will be sent free upon request... simply use the coupon.

EASTMAN KODAK COMPANY, *Medical Division*
341 State Street, Rochester, N. Y.

Please send me a free copy of the 64-page booklet, "X-rays in Dentistry."

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ANESTHETIC SOLUTIONS (R.B.WAITE) *offer you* PLUS QUALITIES

Lord Lister, who won for surgery the battle against infection, helped medicine to banish fear from the minds of patients.

• And, in dentistry, the names Waite and Antidolor have been outstanding in the progress made in eliminating fear of pain in the minds of patients.

Anesthetic solutions (R. B. Waite) have for 45 years enjoyed the confidence of the dental profession. Throughout this period they have been among the leaders in the development of safer, more efficient local anesthetic solutions, and today offer Novocain-Cobefrin, in addition to their time-tested Novocain-epinephrin formulas.

All Waite solutions are analyzed and tested under strict bacteriological and pharmacological supervision for accuracy in compounding and sterility *before they leave our laboratory*.

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No. 15

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LAM-i-NEER

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EXTRA HARD

A platinized gold of light yellow color for Veneer Crowns, Carmichaels, Anterior Inlays and Abutments. Its color blends harmoniously with porcelain facings.

Per dwt. $1.84

Physical Properties Chart on request

Jelenko Helpful Hint No. 15

To prevent wear on stone or plaster opposing models and to allow for a slight relief, adapt a piece of "Burlew Dryfoil" over the teeth. The model must be dampened. The foil is adhesive and will stick to the model without annoyance of falling off. The extreme thinness of the foil makes it ideal for relief on the bite in all procedures, such as inlay work or removable bridgework.

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THEIR RAPID, SMOOTH, GENTLE CUTTING HAS EARNED FOR THEM THE REPUTATION OF . . .

"The World's Finest"

Revelation Burs are sharp and hold their keen edges. They cut rapidly and smoothly, with a minimum of heat and annoyance to the patient. Every Revelation Bur is individually tested for centered head, straight neck and shank, therefore they run true and make accurate cavity preparation possible. The longer life and excellent cutting qualities of Revelation Burs make them the most economical burs for you to use.

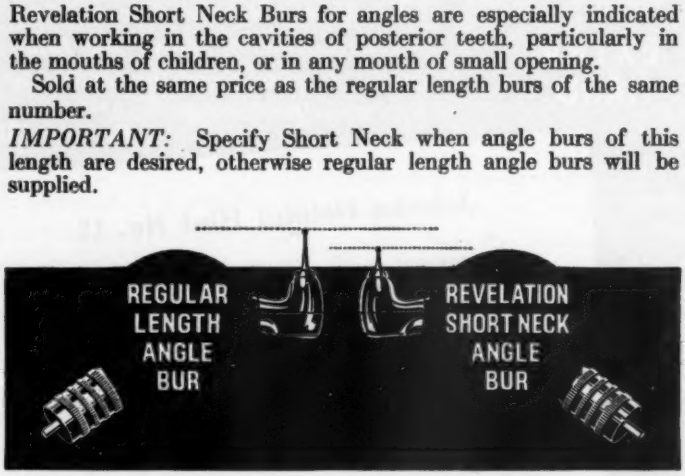
Revelation SHORT NECK BURS FOR ANGLES

Supplied in sizes ½, 2, 4, 6, 33½, 35, 37, 39, 557, 558, 700, 701

Revelation Short Neck Burs for angles are especially indicated when working in the cavities of posterior teeth, particularly in the mouths of children, or in any mouth of small opening.

Sold at the same price as the regular length burs of the same number.

IMPORTANT: Specify Short Neck when angle burs of this length are desired, otherwise regular length angle burs will be supplied.



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THE S. S. WHITE DENTAL MFG. CO.
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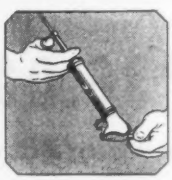
Easier for the Dentist
More Pleasant for the Patient

Elastic Impression Compound is a reversible, hydrocolloid which will take impressions of full, partial, orthodontic, and pre-extraction cases in one piece. It will "spring" from the undercuts of sharply inclined or overlapping teeth without drag or distortion. It can be used also as a "wash" in individual trays made of Impression Tray Compound or of vulcanite.

Albastone, plaster, or S. S. White Metal 160 can be poured directly into it for a cast. No separating medium is required. It has more body and takes greater detail than other hydrocolloids and differs from them in that it concontains a potent antiseptic to prevent the growth of bacteria and mold.

Keeps indefinitely in its hermetically sealed tube, which will not contaminate the compound.

One tube	$0.50
Six tubes	2.75
Twelve tubes	5.25
Thirty-six tubes	15.00



It can be used with or without a syringe, as follows: Merely heat and churn, if a syringe is used, or heat the tube in water and manipulate with the fingers. Then inject into a tray, insert in mouth, chill and withdraw.

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A COMPLETE OPERATING UNIT

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This beautiful cabinet is finished in the following colors to match your operating room equipment—cream white, ivory tan, neptune green, black and mahogany. The solid mahogany cabinet will be supplied unless one of the other colors listed is specified.

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- 8 Tooth Colors that will match 9 out of 10 average cases without blending
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Completely equipped with all colors, liquids, sterilizable guide, and operating accessories for silicate restorations—

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It will equip him to match 100% of his cases with a silicate which, in points of lifelike colors, correct translucence, great strength, durability, and color permanence, simplified color matching, easy mixing and insertion, represents the greatest development in silicate cements during recent years.

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Widely imitated, Kerr Compound has never yet been duplicated in either composition or performance.

At all dealers in a wide variety of specialized shapes and types. Each time you buy it, you are investing in assured results.

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"SAFETY MARGIN"

A statement to the profession concerning the quality of

FLECK'S CEMENT

FLECK'S *is not an ordinary cement.* It has an extra "safety margin" of quality which has made FLECK'S outstanding in reputation and results during a period of more than 30 years. Whether or not you are one of the many thousands of dentists who have already discovered FLECK'S, the simple reasons for its great record should be interesting to you.

STRENGTH—We worked for the greatest density, and made the strongest cement. More than ten tons of pressure are required to crush a small test pellet of FLECK'S.

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PLASTICITY—with FLECK'S, more powder can be incorporated into a given amount of liquid, to minimize free phosphoric in the mix. Yet FLECK'S retains plasticity to seat the most finely adapted work.

UNIFORMITY—All shades of FLECK'S Cement are produced from a standard sno-white base. Every color is uniform in every batch . . . and every batch is guaranteed uniform *in all its colors!*

We are deeply appreciative of your confidence in FLECK'S Cement. Nothing will be left undone to justify that faith.

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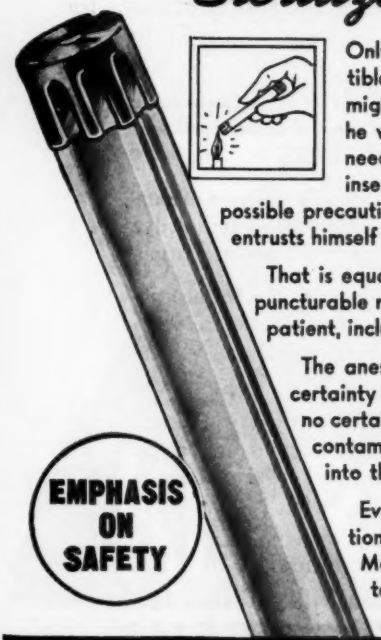
Sterilizable by HEAT



Only two of each hundred patients may be susceptible to infection, but no one can tell who those two might be. So, each patient must be treated as though he were one of the two. Instruments must be boiled, needles and syringes must be sterilized, the point of insertion must be painted with an antiseptic. Every possible precaution must be taken to safeguard each patient who entrusts himself to your care.

That is equally true with Metal Cap Anestubes. Flaming the puncturable metal surface provides 100% protection for *every* patient, including the troublesome two.

The anesthetic within is sterile, of course. But there is no certainty that the outside is kept sterile at all times. There is no certainty that the ordinary porous rubber stopper is not contaminated, and that contamination will not be carried into the solution by the needle.

Every patient needs benign Novol Anesthetic Solution. Every patient needs the protection provided by Metal Cap Anestubes. Every patient needs the protection provided by vacuum packing, assuring *potent, fresh* Novol Solution at all times.

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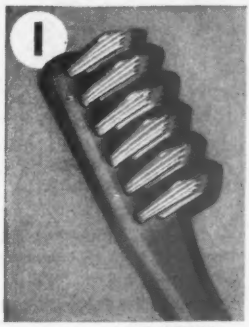
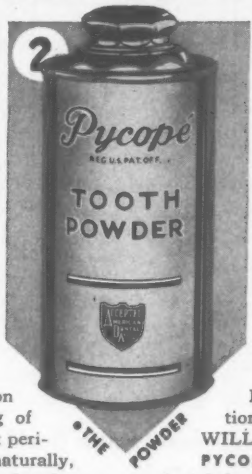
mere brushing

isn't all...

THESE THREE MUST BE RIGHT!



THE BRUSH



THE BRUSHING

THE GROWING realization that improper brushing of the mouth leads to incipient periodontoclasia, has resulted, naturally, in greater emphasis being placed on the necessity of teaching patients a proper brushing technic.

Realizing also that the success of any technic depends on the materials used, dentists are becoming equally careful about the brush and dentifrice they prescribe. They know, for example, that the Charters or Stillman-McCall technic is ineffective with a large brush, or a soft brush, or an arch-form brush; that toothpastes and soapy powders, because they mat a toothbrush, are unsuited for the purpose. And so they increasingly prescribe PYCOPÉ Products.

PYCOPÉ Tooth Powder is "Council-Accepted." A balanced, harmless formula, it does all a dentifrice can do safely. It contains no soap, no questionable medicaments — and WILL NOT MAT a toothbrush!

PYCOPÉ Brushes excel for interdental brushing — a small, straight brush-head; stiff bristles; two rows of six tufts each; a rigid handle. The small head permits easy access to all embrasures. The stiff bristles insure controlled action. And the straight design reaches both smooth surfaces and occlusal fossae.

PYCOPÉ Brushes are specially priced to the profession: junior size, $1.30 a doz.; adult size, $2.50 a doz. — PYCOPÉ, Inc., 2 High St., Jersey City, N. J.

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And I promise I shall do
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BASIC OPERATIONS IN COMMERCIAL CANNING PROCEDURES

IV. SEALING THE TIN CONTAINER

BRIEFLY, the method of food preservation commonly known as "canning" involves subjecting food in a permanently sealed container to a heat process. The heat process destroys spoilage organisms present on the raw food material; the seal on the container prevents reinfection of the food by such organisms. It is, therefore, obvious that the sealing operation—"closing" or "double-seaming" as it is known in the industry—is one of the most important in the canning procedure.

The manufacture of tinplate and "sanitary" cans is described elsewhere (1).

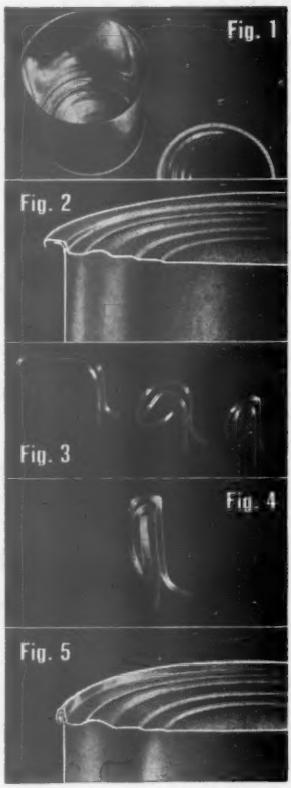
The open cans are received at the cannery in paper cartons or in washed paper-lined box cars, together with the covers which are contained in fiber shipping tubes. Figure 1 shows a can and end ready for use.

In modern canning practice, the cans are first conveyed by automatic runways to can washers, and thence to the filling tables or fillers where the correct amount of properly prepared raw food is put into the cans. The covers or "ends" are placed in the automatic sealing or "closing" machine to which the open can containing the food is mechanically conveyed. In this machine the ends are "double-seamed" onto the can. This operation is portrayed by the accompanying cross-sectional pictures.

In Figure 2 is shown the relation of can to cover before the sealing operation is started; note the relative position of the "curl" on the cover and the "flange" on the can. In this curl, the can manufacturer has placed a gasket or "compound," usually containing rubber. Figure 3 is a series of photographs illustrating the sealing operation in which the curl and flange are first rolled into position and then the layers of metal flattened together to form the final "double-seam" in Figure 4. The rubber compound originally present on the cover supplies the binding material between the layers of metal necessary to insure a permanent or hermetic seal on the container. Figure 5 illustrates in cross-section a closed sanitary can as it comes to the consumer.

In the past twenty-five years great progress has been made in the development of tinplate, compounds and automatic sealing machines. Collectively, these developments enable present-day canners to impose a permanent seal on the cans containing their products more easily and rapidly than ever before in the history of canning.

(1) The Story of the Tin Can, American Can Company, New York, 1935



AMERICAN CAN COMPANY
230 Park Avenue, N. Y.

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The Journal is mailed to you under second class rate and therefore will not be forwarded by the Post Office.

We must have your correct address to prevent delay.

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Thank You

AMERICAN DENTAL ASSOCIATION
212 East Superior Street
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My old address given below is to be cancelled.

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So content . . . she feels Playful!

NO WABBLY denture inhibits her oral functions, causing physical discomfort and the usual mental distress. No irritations make her tissues unbearably sore. Her denture, though new, is stable and comfortable — she is rapidly learning to use it with ease — thanks to her dentist, who thoughtfully prescribed DR. WERNET'S Powder.

It forms an elastic, adhesive, and protective cushion between the denture and the tissues. It holds the denture, *mechanically*, more firmly in place, and soothes and protects tissues that are tender. By promoting comfort and greater assurance, it makes it possible for the denture to be worn more regularly, thus hastening its mastery by the patient.

SEND FOR A FREE SUPPLY to try. Simply mail the lower portion of this page with your card or letterhead to WERNET DENTAL MFG. CO., 190 Baldwin Ave., Jersey City, N. J.

DR. WERNET'S POWDER

Speeds the Mastery of a New Denture!

Processional

• OUT of the shadows of time they came—the seekers. In laboratories the world over they go on seeking. Day after day they forge ahead—with microscope, test tube, beaker and burner—steadily pressing onward, following a vision of the conquest of disease.

Each year the procession advances, past the unknown of yesteryear. Each year it challenges the unknown of now.

All that is within the power of the House of Squibb to do—that men may be healthier, and so, happier—the House of Squibb is doing. For the House of Squibb stands pledged to play its full part in bringing new release from suffering into the lives of men.

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MANY DENTISTS AGREE ON THIS EFFECTIVE ADJUNCT IN MANAGING PYORRHEA

Electrocoagulatory control of pyorrhea is today bringing more patients to many dentists than has any other technic, theory, or appliance developed in recent years.

And, no wonder.

It saves the patient time, discomfort, and money.

It eliminates shock, clotting, swelling, bleeding, granulation, and loss of bony tissue. It minimizes pain during and after treatment. It makes possible scaling in a visualized field—after operation. It does away with packing and stitches. It is a procedure that is easily and quickly mastered and that results in fees that are fair for both patient and dentist.

Many dentists recommend it and, in their practices, use the G-E Model "B" Microsurgical Unit because it delivers high-frequency current of just the proper characteristics and is furnished with such precise and absolute control that accurate duplication of technic is assured.

Yes, and better dental dealers recommend both the method and the Model "B" Microsurgical Unit. If you are interested in an alternate method for the management of pyorrhea, we will send reprints of recent articles, letters of commendation, and full information regarding the G-E Model "B" Microsurgical Unit. Address Dept. H116.

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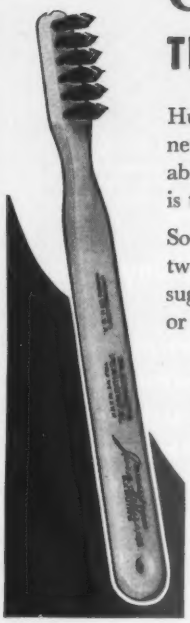

Growing in Favor

The DR. BUTLER *Black Bristle* BRUSH

Hundreds of dentists have already tried, prescribed or dispensed the new Butler Black Bristle Brush. This special black bristle (obtainable only from certain boars in North China and Southern Siberia) is the toughest and most lasting bristle known!

So that you can compare it with our regular bristle, we offer you two brushes for 40c (covers only cost of packing and shipping). We suggest you check a hard or extra-hard black bristle, and a hard or extra-hard unbleached.

Do not send checks. Stamps or coin only, please.

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I enclose 40c for two brushes:

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SINCE 1899 SPECIALIZED SERVICE

A DOCTOR SAYS:

"I deeply appreciate the protection afforded by your company and the wholeheartedness with which you went to battle for me."

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TOOZ
THE 2 IN 1 X-RAY FILM
XX
TRADE MARK

Patented in U. S. and principal countries of the world. U. S. Patent No. 2104715. Other patents pending.

New Economy and Convenience in Dental X-Ray Films

TOOZ, the 2-in-1 x-ray film, is the most important improvement in x-ray film packets since the advent of the x-ray. TOOZ permits taking two *different* x-ray pictures with one packet! A patented assembly of sensitized film, placed on both sides of a radiopaque member, permits the alternate exposure of both sides of the packet. This means half the number of packets to handle at the chair, half the number to open in the dark room. It means also a saving of practically half the expense!

TOOZ packets are machine wrapped in white sanitary moisture-proof paper with new crimp-free rounded corners. TOOZ combines pliability with rigidity in ideal proportions assuring complete patient comfort and undistorted radiographs.

TOOZ requires no change in technic. TOOZ encourages additional x-rays because of lower cost. TOOZ are extremely easy to use, simple to open. TOOZ are manufactured in 3 distinct types: Regular-Slow, Intermediate Blue Base and Intermediate Clear Base.

Ask your dealer to show you TOOZ.

For double duty CHOOSE TOOZ!

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Announcing... BURTON'S
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Including

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"THE BARIUM LIGHT BAND"

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..Gentlemen, Burton gives you its new DENTAL DIAGNOSTIC INSTRUMENTS which now include the "BARIUM LIGHT BAND" . . . a new principle in dental diagnosis employing a selected band of the visual spectrum for determining the relative density of soft tissue. But this is not all. For Burton's new DENTAL DIAGNOSTIC SET includes also the **CHARTED** VITALOMETER as well as many other instruments, all as essential to the art of dental diagnosis as the x-ray itself.

No dental office today is complete without these new and approved dental diagnostic aids. Dollar for dollar you will find them more valuable than anything you possess.

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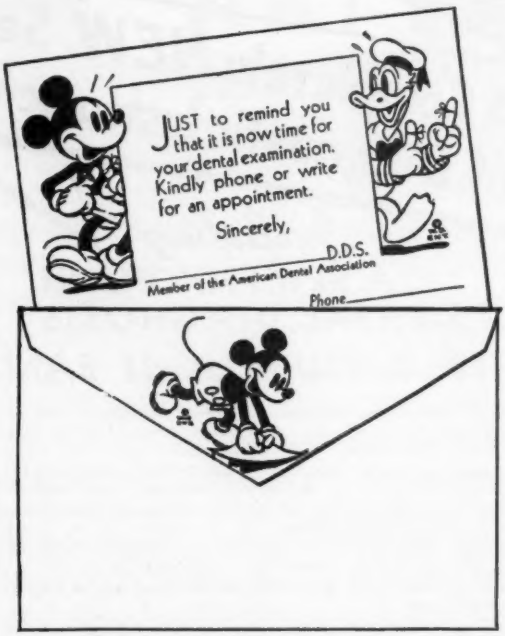
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Sincerely,
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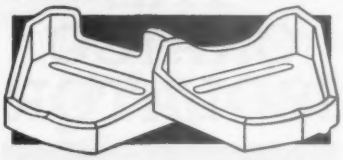

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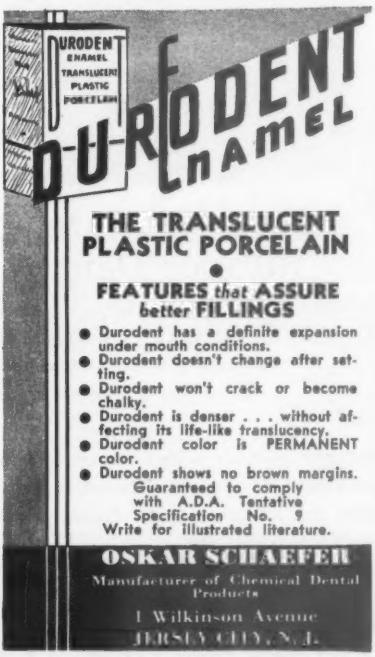

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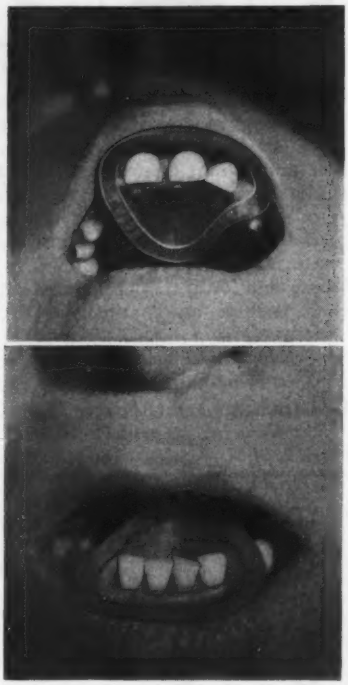

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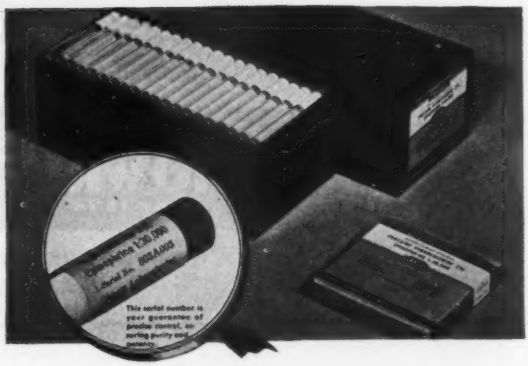

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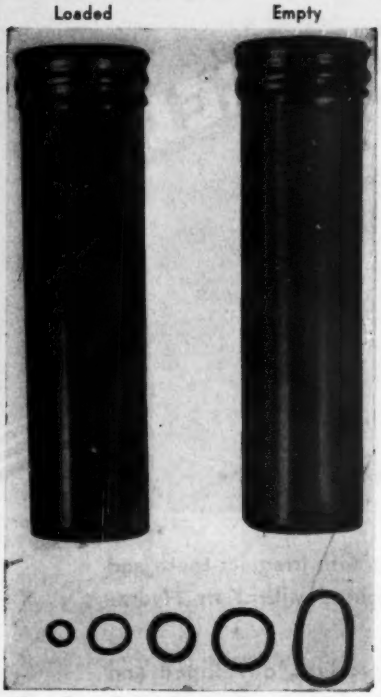

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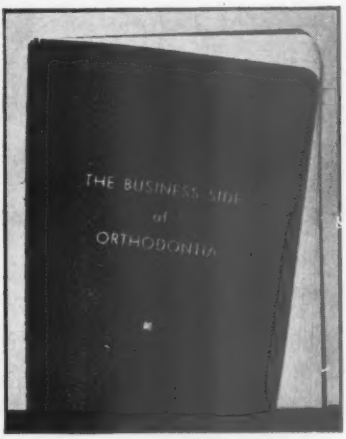

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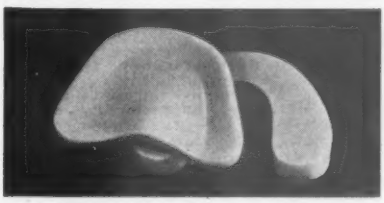

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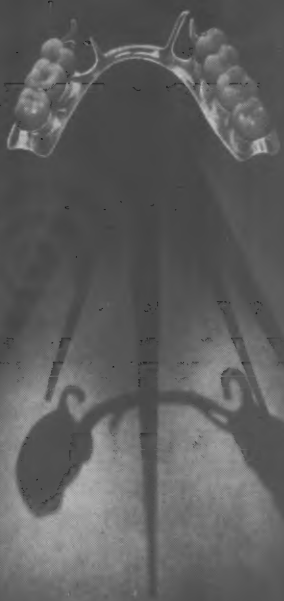

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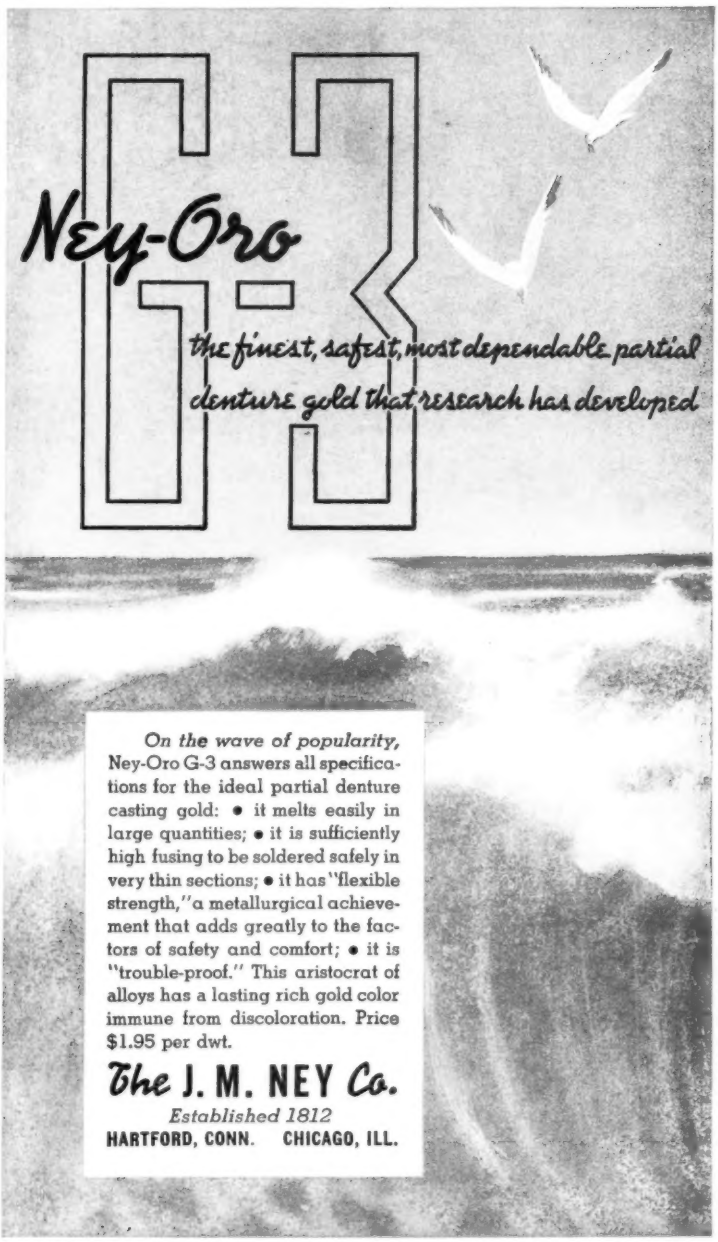
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